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Manning, John Joseph; Eding, L. H.; Manning, John Joseph; Eding, L. H.

Rensselaer Polytechnic Institute

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INVESTIGATION OF THE EFFECT OF
STIFFNESS OF MEMBERS UPON
THE SOLUTION OF VIERENDEEL TRUSSES

LT. (jg) J. J. MANNING, JR.

LT. (jg) L. H. EDING

Thesis
M3

Postgraduate School.
U. S. Naval Academy,
Annapolis, Md.

INVESTIGATION
OF
THE EFFECT OF STIFFNESSES OF MEMBERS
UPON THE SOLUTION OF VIERENDEEL TRUSSES

by

LT(jg) J. J. MANNING, JR.,
LT(jg) L. H. EDING

Submitted to the Faculty of Rensselaer Polytechnic Institute in Partial Fulfillment of the Requirements for the Degree of Master of Civil Engineering.

Troy, New York

June 1, 1948

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Introduction

A Vierendeel Truss is composed of a series of rectangular or trapezoidal panels without diagonal members. It is named for its inventor, Professor Arthur Vierendeel of the University of Louvain in Belgium. This type of truss has been popular in Europe, particularly in Belgium, since 1896 when the first bridge of this type was built in that country. In the United States its use to date has been limited to concrete viaduct bents, small roof trusses, and rigid frame foundations for buildings. It has been reported that a bridge using a concrete Vierendeel Truss system has been built recently on the West Coast, but as yet there is no printed matter available on that project.

The Vierendeel presents an exceptionally good appearance, the elimination of diagonals allowing a very clean looking structure. Its slow adaption in this country may be attributed to two factors; (1) until recently the only methods of solution were extremely long and tedious, sufficiently so to discourage only the most able and experienced in the field of structural design, and (2) the use of this truss has been so limited in this country that very few examples are available from which to make an intelligent investigation of the economic aspects of the problem.

METHOD OF SOLUTION

The method of solution used throughout this thesis was an application of slope deflection as outlined by Mr. A. Amirikian in his "Analysis of Rigid Frames". While there are other methods available for the solution of Vierendeel trusses it was felt that the procedure outlined by Mr. Amirikian was the simplest and most direct approach to the problem published to date. Inasmuch as his text has become a standard addition to all libraries of treatises on Indeterminate Structures, none of the derivations will be presented here and only a brief outline of the basic formulae and procedures will be given.

By way of simplifying the fundamental moment equation of a member having constant moment of inertia and modulus of elasticity

$$M_{AB} = 2 E \frac{I}{H} (2\theta_A + \theta_B - 3 \frac{\Delta}{L}) - FM_{AB}$$

the following abbreviated form is used

$$M_{AB} = K (A + \frac{B}{2} - R) - FM_{AB}$$

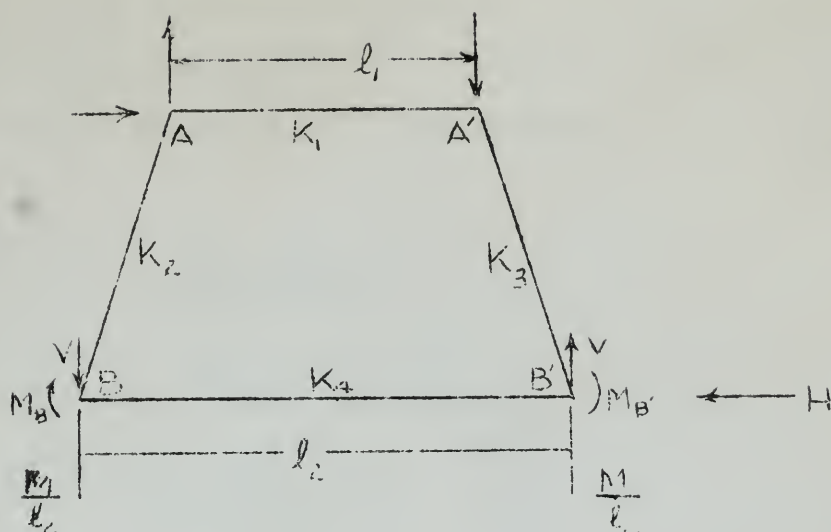
where

$$K = \frac{I}{L} \qquad B = 4E\theta_B$$

$$A = 4 E\theta_A \qquad R = 6E \frac{\Delta}{L}$$

This simplification is used throughout the solution and greatly reduces the tediousness of the more complex equations.

Upon connecting four of these beams to form a panel and a series of panels to form a truss, the interdependence of the members and joints becomes pronounced. In order to consider the effect of varying stiffnesses in members forming or adjacent to a joint on both the moment at the joint and the deflection in the beam, expressions are developed for each joint encountered. These expressions will be known hereafter as the Joint and Deflection Equations. Likewise the moments obtained in the solution of any joint will vary widely with the shape of the panel, moments and shears applied and location of application, and the stiffnesses of the panel under consideration. In order to take these variables into consideration, Load Constant Equations are derived for each joint. Upon solution of these equations the load constant is equated to the Joint and Deflection equations which are then solved to find the deflection angles of the joints and the deflection of the adjacent member. Because of its basic nature the fundamental expression for the load constants of a typical panel are reproduced here in part.



$$(a) \quad M_B + M_{B'} = V l_2 - H$$

$$(b) \quad M_A + M_{A'} + M_B + M_{B'} = V(l_2 - l_1) - Hh$$

Substituting V from (a) in (b)

$$(c) \quad M_A + M_{A'} + (1-m)(M_B + M_{B'}) = mH - Hh$$

where

M = overturning moment of the external forces taken about the bottom of the panel.

H = shear, i.e., the sum of the lateral forces above the panel.

V = vertical reaction just above the bottom joints of the panel.

M_A = end moments at top.

M_B = end moments at bottom.

K = values of load constant for joint or panel under consideration.

$$m = \frac{l_2 - l_1}{l_2}$$

$$n = \frac{l_1 - l_2}{l_1}$$

By substituting the right hand part of equation (c) in a previously developed shear expression for a typical joint equation we arrive at load constants for a typical panel

$$Q \text{ of } R = \frac{Hh - mM}{(2-m)(k_2 - k_3)}$$

$$Q \text{ of } A = \frac{(nk_1 - k_2)(Hh - mM)}{(2-m)(k_2 - k_3)}$$

$$Q \text{ of } B = \frac{k_2 (mM - Ph)}{(2-m)(k_2 - k_3)}$$

Further importance is attached to equation (c) inasmuch as it acts as a check for the moment values obtained in the solution of any panel.

The procedure for the solution of Vierendeel trusses is an adaptation of this single panel solution. In order to avoid the difficulty of an exact solution the truss is first treated as a system of separate and independent panels. Each panel is solved for its own load neglecting moment introduced from other panels via the joints. To compensate for the error introduced in the original computation the solution is repeated, this time using the moments obtained from adjacent panels as the new load constants for the panel being solved. The procedure is repeated, again interchanging moment increments between panels. Inasmuch as these increments diminish in size rapidly, two corrections will ordinarily provide a solution of sufficient accuracy.

The final moment will be the algebraic sum of the original moment determination and the successive increments.

For the Vierendeel truss used in this design with all loads applied at the panel points and the upper and lower chords having the same stiffness ratio, the deflection angles of the top chord joints will equal those of the respective bottom chord joints, and the joint and deflection equations become:

$$1.5K_1 + K_2 + \frac{(3 - m)(nk_1 - k_2)}{2(2 - m)} A =$$

$$\frac{k_2}{2} + \frac{(3 - 2m)(nk_1 - k_2)}{2(2 - m)} B = -Q_A$$

$$k_2 + 1.5K_4 + \frac{(3 - 2m)k_2}{2(2 - m)} B =$$

$$\frac{k_2}{2} + \frac{(3 - m)k_2}{2(2 - m)} A = -Q_B$$

$$R_1 = \frac{(3 - m)A + (3 - 2m)B}{2(2 - m)} = Q_{R1}$$

These equations, with appropriate K and angle notation are set up for each of the eight panels and equated to the corresponding load constants as obtained from the following formulae:

$$-Q_A = \frac{(nk_1 - k_2)(m\bar{l}_1 - H_1l_1)}{2(2 - m)k_2}$$

$$-Q_B = \frac{(H_1l_1 - m\bar{l}_1)}{2(2 - m)}$$

$$Q_{R1} = \frac{H_1l_1 - m\bar{l}_1}{2(2 - m)k_2}$$

The two equations in A and B obtained from the solutions of these sets of equations are then solved simultaneously and the value for R_1 determined. Substituting in the fundamental moment formulae

$$M_{AB} = K \left(A + \frac{B}{2} - R_1 \right)$$

$$M_{BA} = K \left(B + \frac{A}{2} - R_1 \right)$$

the original moment values for the panel are obtained. These moments are then corrected and the sum of the original moment plus corrections give us the final moment values.

Influence lines were plotted for the final moment values and design moments based on the combined loadings of one E-60 railroad rail and one lane of H15 - S12 - 44 highway loading were computed.

PURPOSE

The purpose of this investigation is to determine the influence of the assumed stiffnesses of the members upon the eventual design of the truss.

In the design of a Vierendeel truss by the method previously described, the first step is to assume a basic truss and loading system. A solution is then worked for this primary system, corrected for the actual loads and conditions, and the solution repeated with appropriate corrections to arrive at the final design, usually three or more solutions being required.

Upon embarking upon this type of solution, the engineer is faced with two fundamental assumptions, (a) the loading to be used, and (b) the stiffnesses to select for his members. The first of these may be handled in the conventional manner, i.e. assume a loading of one kip and compute values for plotting influence lines to which he may later apply his design loads.

The second assumption, selecting appropriate stiffnesses for his members, presents a more difficult problem. Unfortunately so little material has been published on Vierendeel trusses in this country that there is little to guide him in this step.

Likewise the rarity of this type of structure in the United States makes it extremely unlikely that he could obtain any useful data on existing cranes of this type. Obviously it is up to the engineer to make such assumptions as he sees fit. In order to do this properly he should, of course, have some advanced knowledge of the distribution of moments throughout the truss in order that he could correctly proportion his stiffnesses to their appropriate moments. Previous experience lacking, he will be forced to estimate the probable moment intensities and select stiffnesses accordingly. This procedure leaves much to be desired, for regardless of a man's previous experience it is not to be expected that he could closely approximate the distribution of moments in a truss entirely unfamiliar to him, and his stiffness values will be subject to the same degree of uncertainty.

The question now arises as to the degree in which the assumed values of stiffnesses will affect the solution of the truss. It will be noted that the stiffness factor K occurs in four of the six basic equations for the solution, and it might be supposed that any wide variation in the true and assumed values of K would produce a similar

variation in the moment values obtained. It is the purpose of this thesis to determine the effect of widely varying stiffness values upon moments in a typical Vierendeel truss. The case selected was for a 240 foot lift span for a lift bridge across the entrance to a harbor inlet. The span is to carry one lane of highway traffic on each side of a single track standard gauge railway.

FIRST SOLUTION

For the first solution K values were chosen primarily from sample problems accompanying an article on Vierendeel trusses by Mr. Dan Young in the 1937 Proceedings of the A. S. C. E. Whether or not Mr. Young intended that the stiffness values in his problem should closely approximate actual conditions is unknown. On the condition that these values might approximate the trend of moment distribution, our assumed values were made to follow a similar pattern of variation.

SECOND SOLUTION

For the second solution the values of K were arrived at by using the moments obtained in the first solution. Since

$$K = \frac{I}{L} = \frac{Mc}{fL}$$

it was possible to solve directly for a value of K, inasmuch as members of constant depth (30") were proposed to improve the appearance of the truss and f and L were known values. In this way it was possible to determine the effect of closely approximating moment and stiffness values throughout the truss.

THIRD SOLUTION

For the third solution all K values were assumed to be unity. It was felt that since both moment and stiffness values vary throughout the truss that by holding one of these constant it might be possible to observe the variation of the other. In this way the stiffness values of the second set of computations of any truss might be made to closely approximate the stiffnesses required by the actual moments and thus expedite and simplify the final design of the truss.

FOURTH SOLUTION

For purposes of contrast the stiffness values of the fourth solution were taken exactly opposite to those of the first solution. In other words the same numerical values were used but varying in an inverse order of the first solution. In this way it was hoped to observe the effect of the direction of variations of stiffness values upon the moments computed.

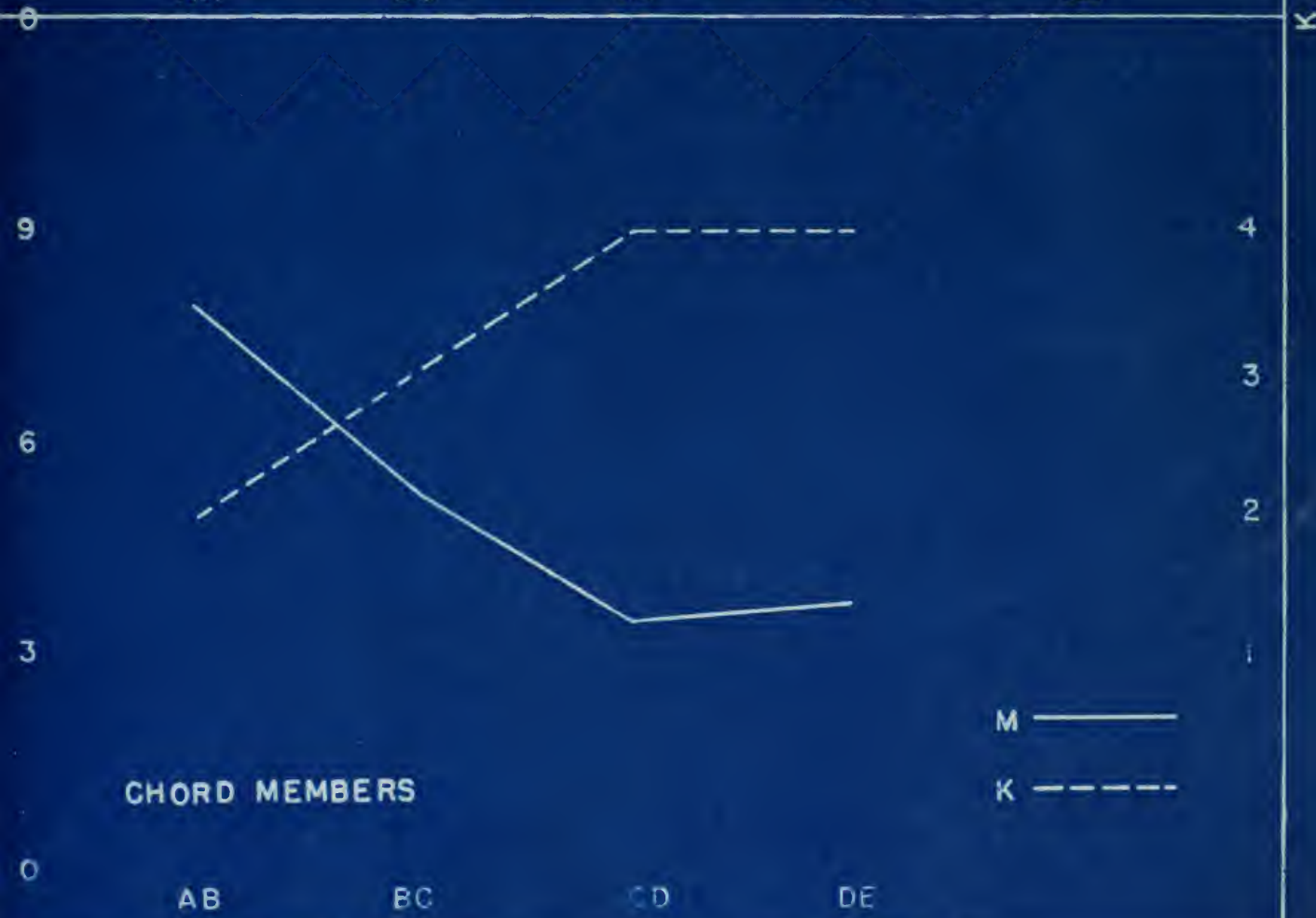
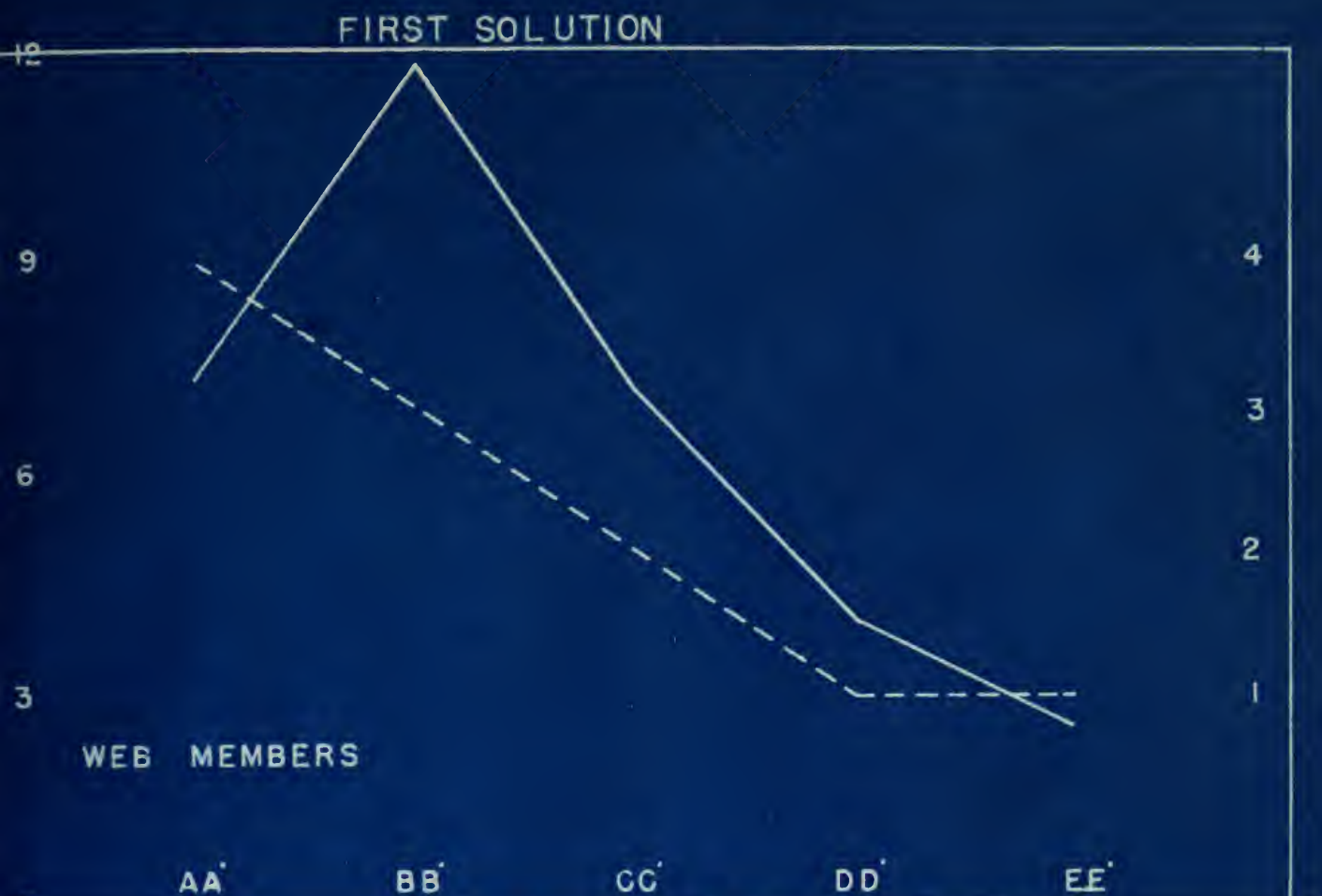
DESIGN MOMENTS

Member	Set 1		Set 2		Set 3		Set 4	
	K	M	K	M	K	M	K	M
AA'	4	7,362	160	7,222	1	7,689	1	7,987
BB'	3	11,745	232	11,762	1	10,600	1	9,030
CC'	2	7,243	136	7,575	1	7,781	2	8,497
DD'	1	4,046	74	4,447	1	5,170	3	5,844
EE'	1	2,593	47	3,000	1	3,282	4	3,435
AB	2	7,958	200	7,212	1	7,689	4	7,987
BC	3	5,360	134	5,492	1	5,465	4	7,329
CD	4	3,548	90	3,529	1	4,043	3	4,436
DE	4	3,790	95	2,877	1	3,020	2	2,986

For purposes of clarity the tabulated results of the moment solutions have been put in graph form on the following pages. Taking web and chord members separately the values of moment and stiffness were plotted for each member for a given solution. The plotted points were then connected in order to indicate the trends of variation of both moment and stiffness. With one exception the moments and stiffnesses as plotted represent the actual values obtained and used in the solution. The one exception is in the case of the second solution. Here the values of K ranged from 200 to 47 and would have been at best unwieldy to plot on the scale adopted. Inasmuch as the numerical value of K appears to affect the solution only in its relative size compared to the other K values the K's for this solution were plotted on a relative scale. By taking $K = 47$ as unity the other K values were reduced to the same relative scale by dividing by 47, greatly simplifying plotting operations and presenting a better method of comparison with the other solutions.

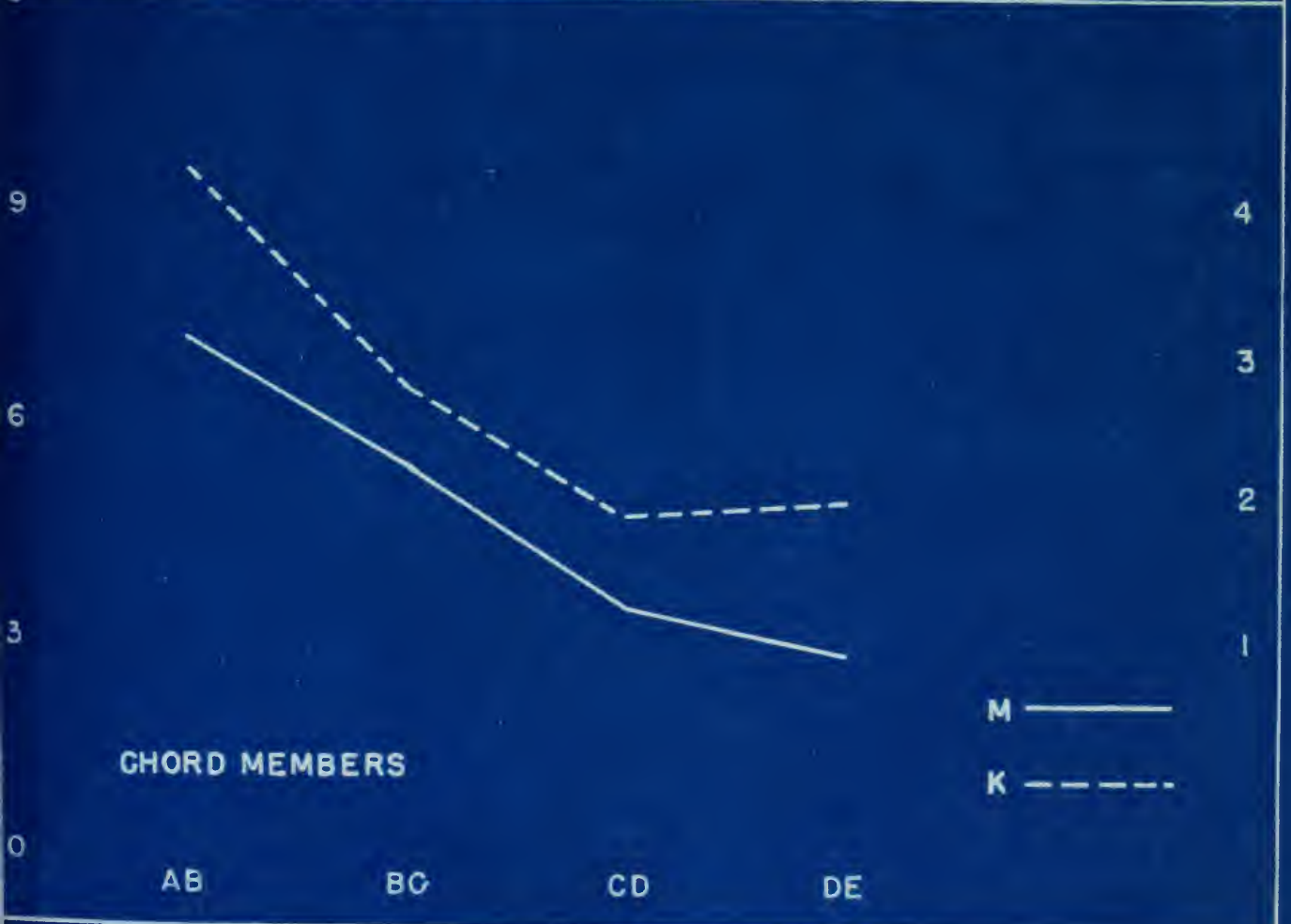
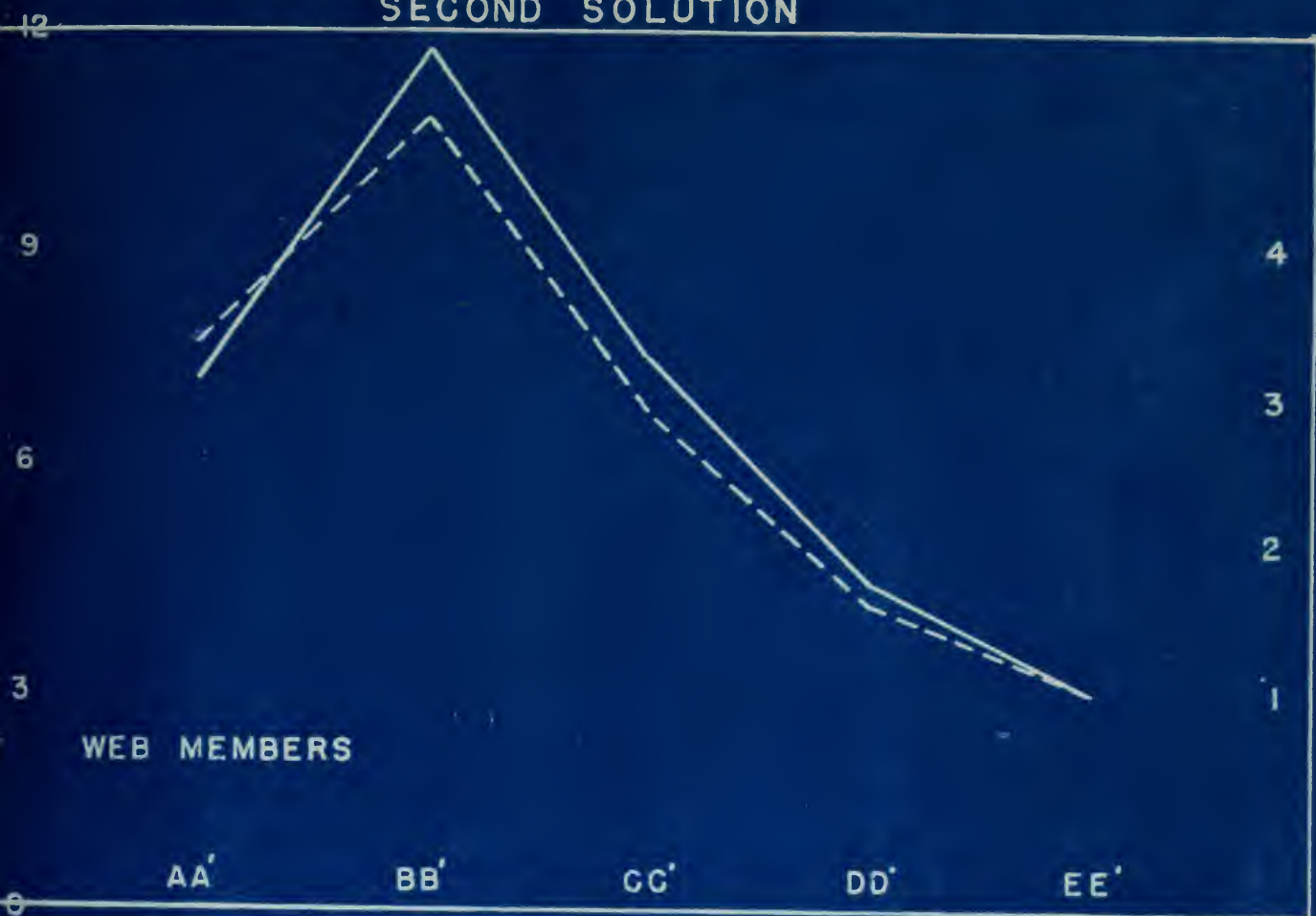
In examining the first solution curves there is little evidence to indicate any direct relationship in the variation of the K values assumed and

the moments obtained. In the case of the web members, CC' and DD' have similar relationships of moment and stiffness. There is an inverse relationship occurring in the case of the other three members. As for the chord members, the inverse relationship exists throughout, high moment values accompanying low stiffness values and vice versa.



The second solution represents a case in which the general trend of moment values closely follows the trend of the stiffness values assumed, with the sole exception of member DE. It is to be noted that there is no proportionality or direct relationship between the values of K and M . While the picture thus presented might seem to indicate a general tendency for moment values to follow stiffness assumptions, it must be remembered that the stiffness values for this solution were obtained directly from the moment values of the previous solution. In effect the moment values have changed but little and by the nature of their assumption it is to be expected that the stiffness values would vary in much the same way as the moment values.

SECOND SOLUTION



The third solution is unique in that it presents an unvarying stiffness curve, all values of K being unity. It is to be noticed that in neither size nor pattern of variation do the moment values differ substantially from the previous solutions. At no place do either of the moment curves display any tendency to follow or parallel the trend of the K values assumed.

1877

1878

1879

1880

1881

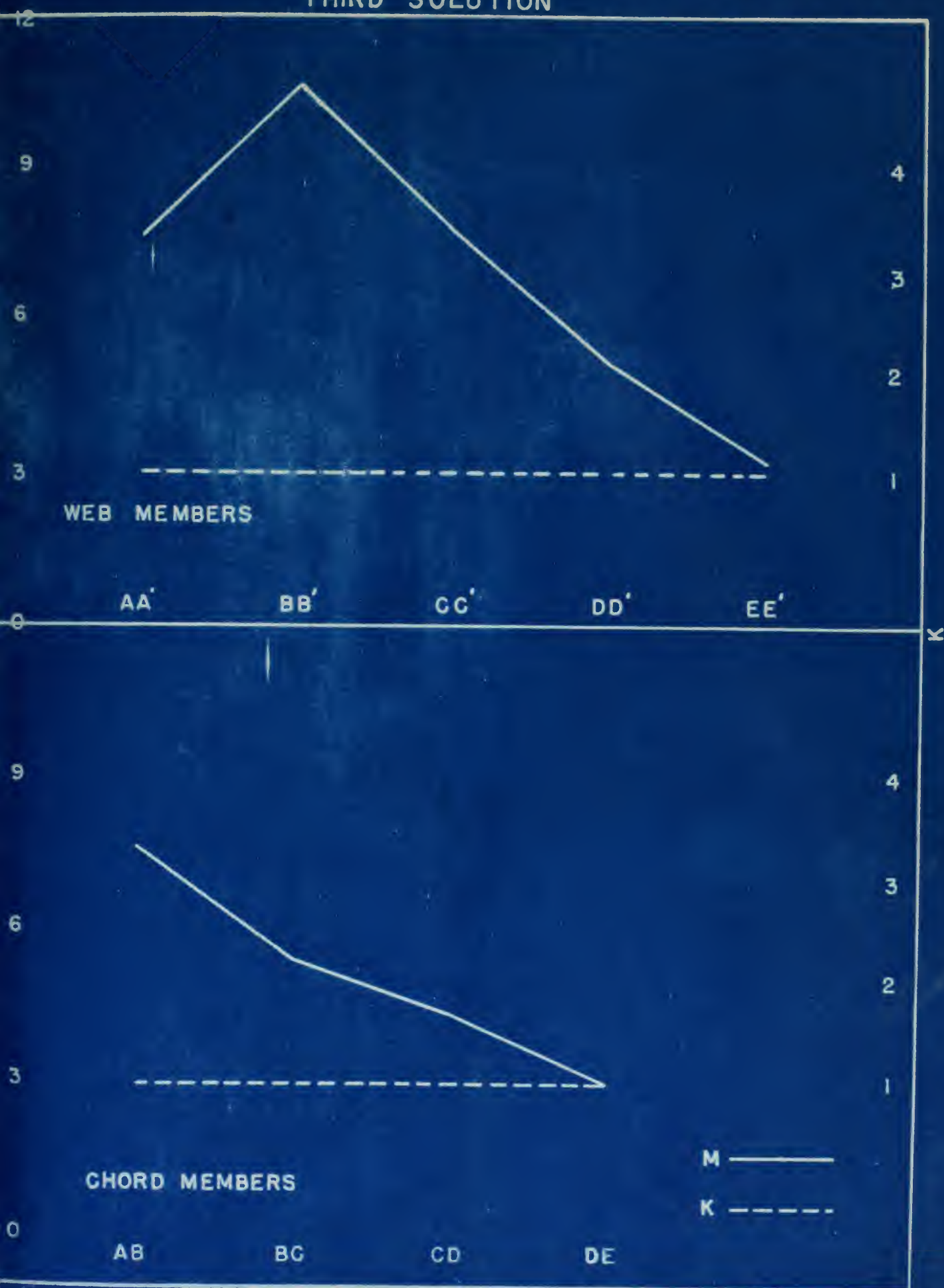
1882

1883

1884

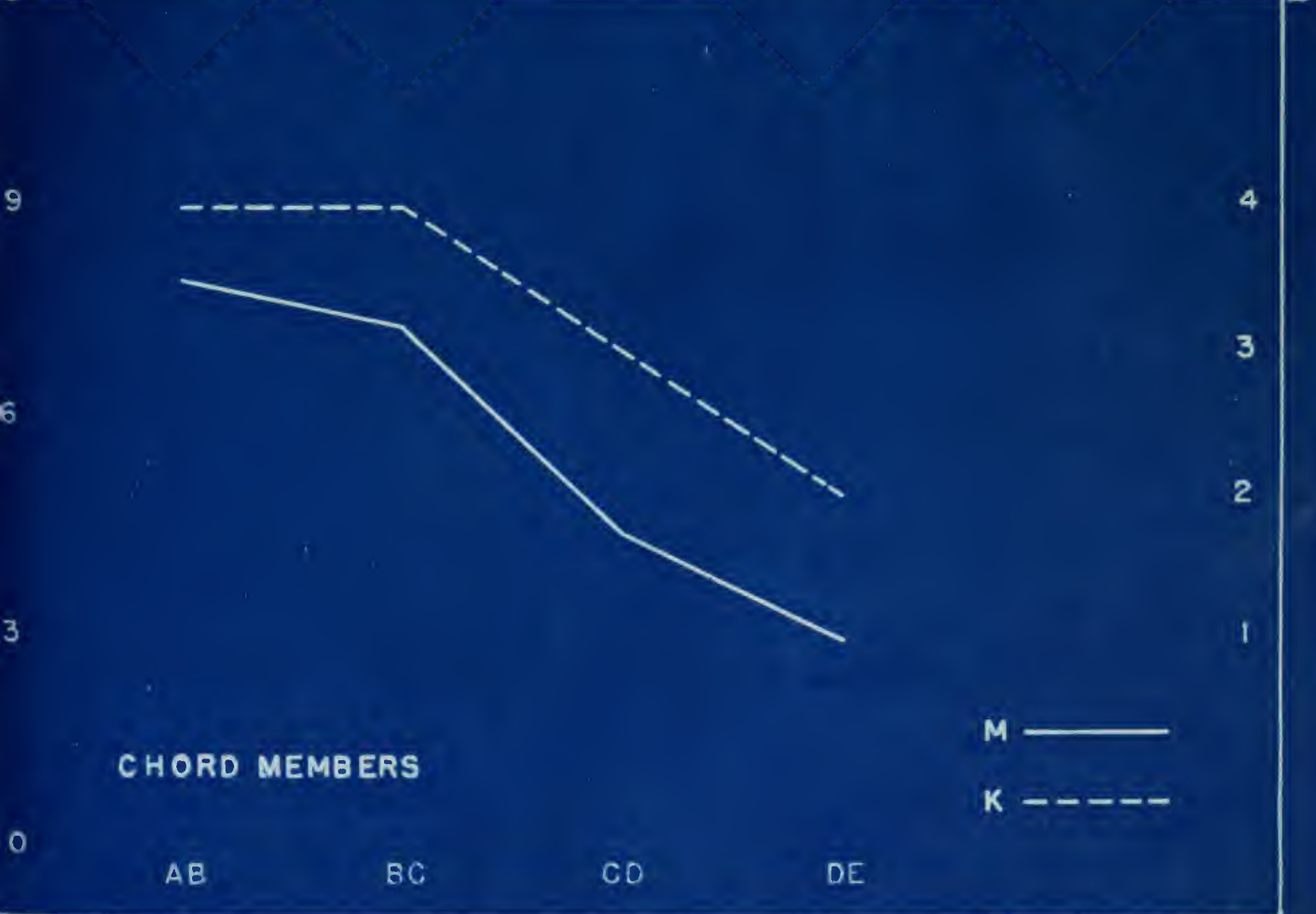
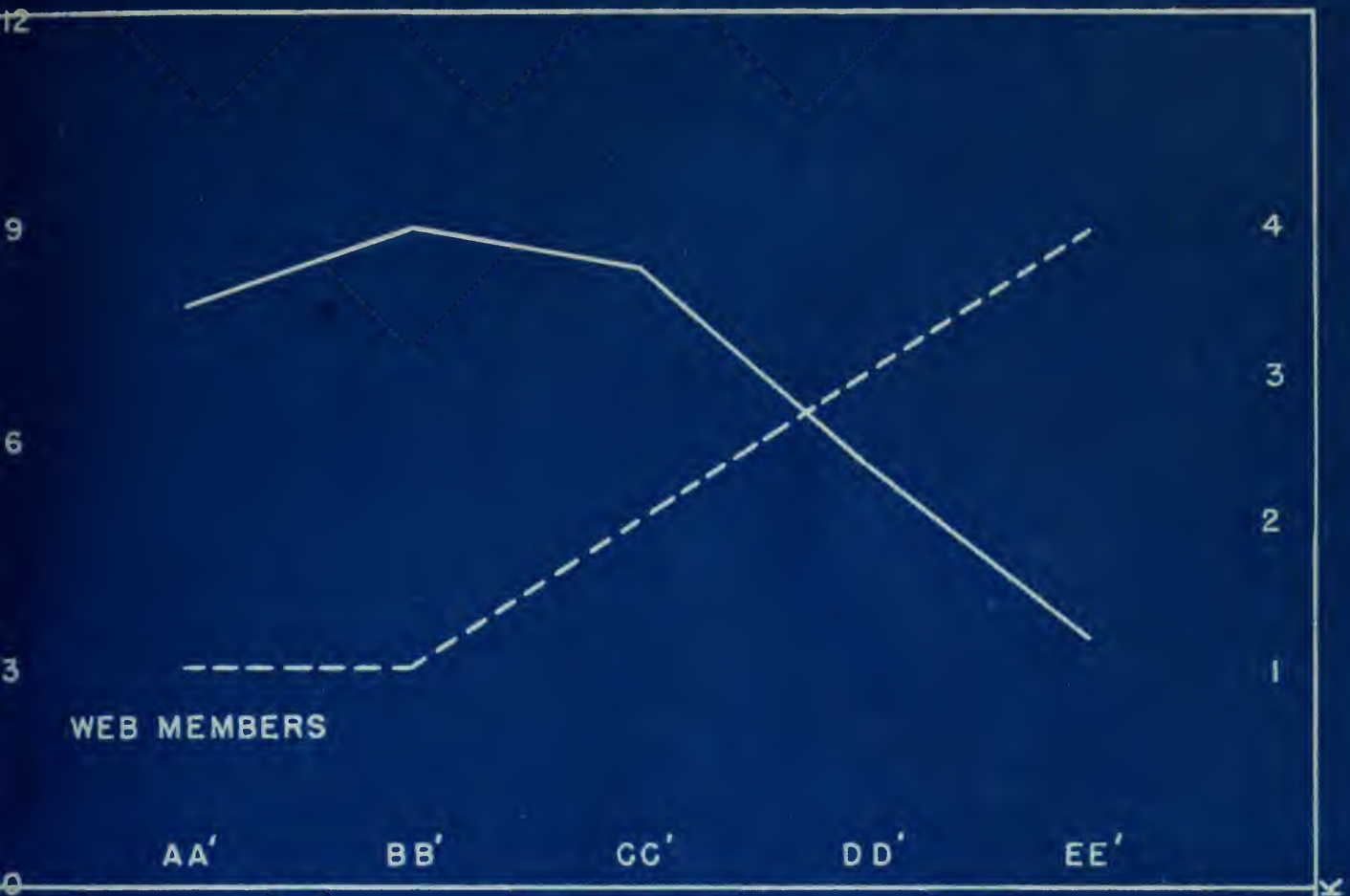
1885

THIRD SOLUTION



The fourth solution graph represents a system of stiffness values assumed in an exactly inverse order of those chosen for the first solution. Contrary to the results obtained in that solution we now find that the chord moments tend to follow the same general pattern as their corresponding K values while the web members follow a completely dissimilar path from their K values. As before there is but little variation in either the size or trend of the moments obtained as compared with the resultant moments of the first solution.

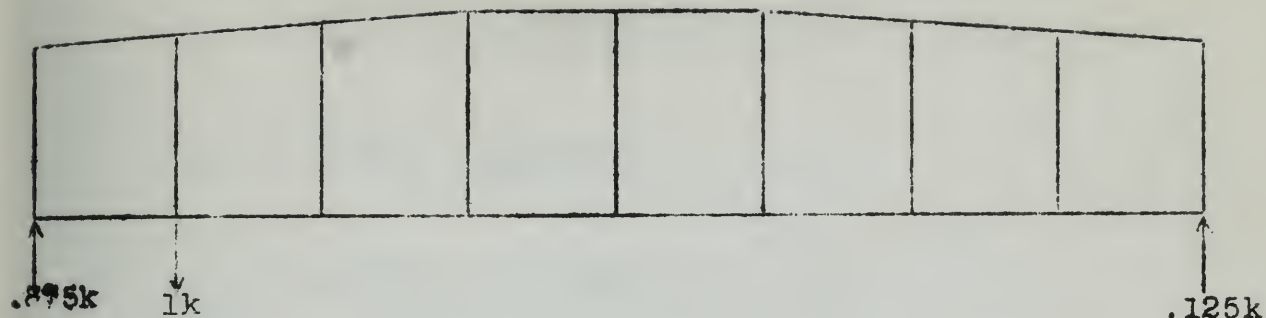
FOURTH SOLUTION



CONCLUSIONS

The results obtained from the four solutions presented show but one common trend, i.e. in no case do the resultant moments of any solution differ widely from those of any other solution. Conversely the stiffness values assumed for any one solution differ widely from those of all other solutions. No relating tendencies are disclosed, a lower stiffness value does not in every case bring a lower moment nor does a higher stiffness value display any significant effect on moments obtained. Likewise a change in the direction of variation of stiffness values seems to have little effect on the moments obtained. Therefore it must be concluded that the size, direction, or degree of variation of assumed values of stiffness of members does not materially affect the moments obtained in the first solution of a Vierendeel truss by this method.

In view of these conclusions it is recommended that in the solution of trusses by this method the first solution be worked with the assumption of all K values as unity. Such an assumption would permit a simpler and quicker solution of the truss with no loss of accuracy.



.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.875	-.125	-.125	-.125	-.125	-.125	-.125	-.125
26.25	22.50	18.75	15.00	-15.00	-11.25	-7.50	-3.75

Panel 1

$$-Q_A = \frac{(.0942 \times 4 - 2)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)2} = 5.32$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.27$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)2} = 3.14$$

Panel 2

$$-Q_B = \frac{(.0463 \times 3 - 3)(.0443 \times 22.5 - .125 \times 30)}{2(2 - .0443)3} = -1.16$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)3} = -0.40$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 4)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)^4} = -1.16$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - n)^4} = -.30$$

Panel 4

$$-Q_D = \frac{(0 - 4)(0 + .125 \times 30)}{2(2)^4} = -.94$$

$$-Q_E = \frac{(-.125 \times 30 - 0)}{2 \times 2} = -.94$$

$$Q_{R4} = \frac{-.125 \times 30 - 0}{2(2)^4} = -.23$$

Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -.94$$

$$-Q_F = \frac{-.125 \times 30}{4} = -.94$$

$$-Q_{R5} = \frac{-.125 \times 30}{4 \times 4} = -.23$$

Panel 6

$$-Q_G = \frac{(.0517 \times 2 - 4) - (.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)^4} = -.80$$

$$-Q_F = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -.62$$

$$-Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)^4} = -.20$$

Panel 7

$$-Q_H = \frac{(.0463 \times 3 - 3)(.0443 \times -7.5 - -.125 \times 30)}{2(2 -.0443)^3} = -.083$$

$$-Q_G = \frac{(-.125 \times 30 -.0443 \times -.75)}{2(2 -.0443)} = -0.87$$

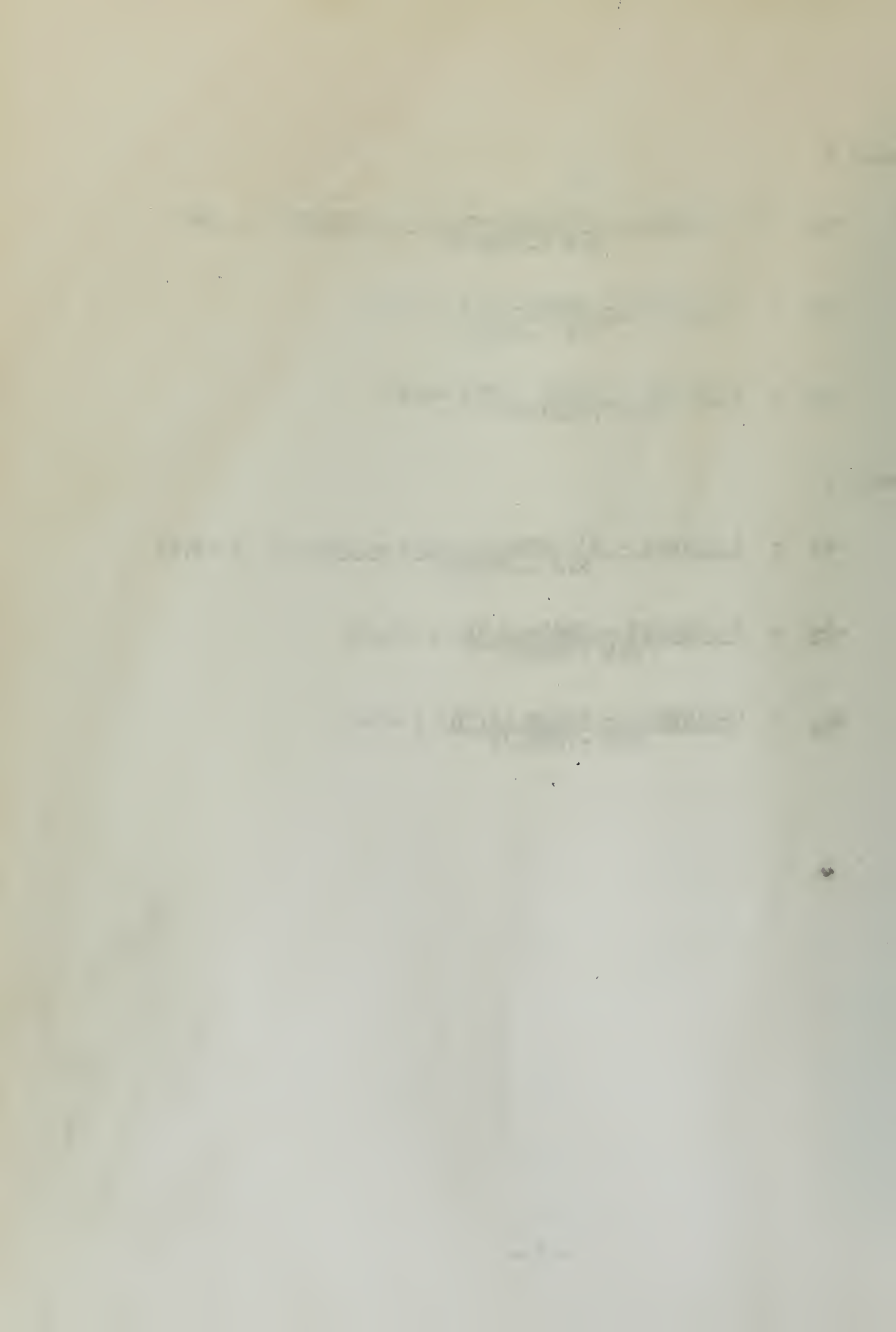
$$-Q_{R7} = \frac{(.125 \times 30 -.0443 \times -.75)}{2(2 -.0443)^5} = -0.29$$

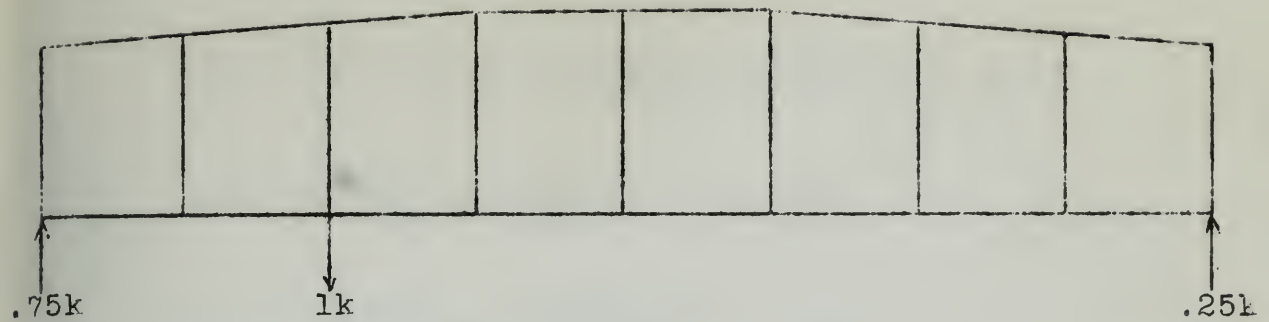
Panel 8

$$-Q_I = \frac{(.0942 \times 4 - 2)(.0861 \times -3.75 - -.125 \times 30)}{2(2 -.0861)^2} = -0.73$$

$$-Q_H = \frac{(-.125 \times 30 -.0861 \times -3.75)}{2(2 -.0861)} = -0.90$$

$$Q_{R8} = \frac{(-.125 \times 30 -.0861 \times -3.75)}{2(2 -.0861)^2} = -0.45$$





.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.75	.75	.25	-.25	-.25	-.25	-.25	-.25
22.5	45.0	37.5	30.0	-30.0	22.5	-15.0	-7.50

Panel 1

$$-Q_A = \frac{(.0942 \times 4 - 2)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)2} = 4.56$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)2} = 2.69$$

Panel 2

$$-Q_B = \frac{(.0463 \times 3 - 3)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)3} = 4.98$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)3} = 1.74$$

$$x_p = \frac{1}{2} \left(x_1 + x_2 + \dots + x_n \right) = \frac{1}{2} \left(x_1 + x_2 + \dots + x_n \right) = \frac{1}{2} \left(x_1 + x_2 + \dots + x_n \right)$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 4)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)4} = -2.33$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)4} = -.59$$

Panel 4

$$-Q_D = \frac{-4(0 + .25 \times 30)}{4 \times 4} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30 - 0)}{4} = -1.87$$

$$Q_R = \frac{(-.25 \times 30 - 0)}{4 \times 4} = -.47$$

Note: The only term that changes is $(H_1 L_1 - m M_1)$ and since this is doubled when the load is at panel point 2, it is tripled when the load is at panel point 3, etc. The following constants are derived by multiplying those obtained when the load was at PPl by the factors 2, 3, & 4.

Panel 5

$$-Q_L = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -.47$$

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Panel 6

$$-Q_G = -1.60$$

$$-Q_F = -1.64$$

$$Q_{R6} = -.41$$

Panel 7

$$-Q_H = -1.67$$

$$-Q_G = -1.75$$

$$Q_{R7} = -0.58$$

Panel 8

$$-Q_I = -1.45$$

$$-Q_H = -1.79$$

$$Q_{R8} = -0.90$$

Load at PP3

Panel 5

$$-Q_E = -2.81$$

$$-Q_F = -2.81$$

$$Q_{R5} = -0.70$$

Panel 6

$$-Q_F = -2.47$$

$$-Q_G = -2.40$$

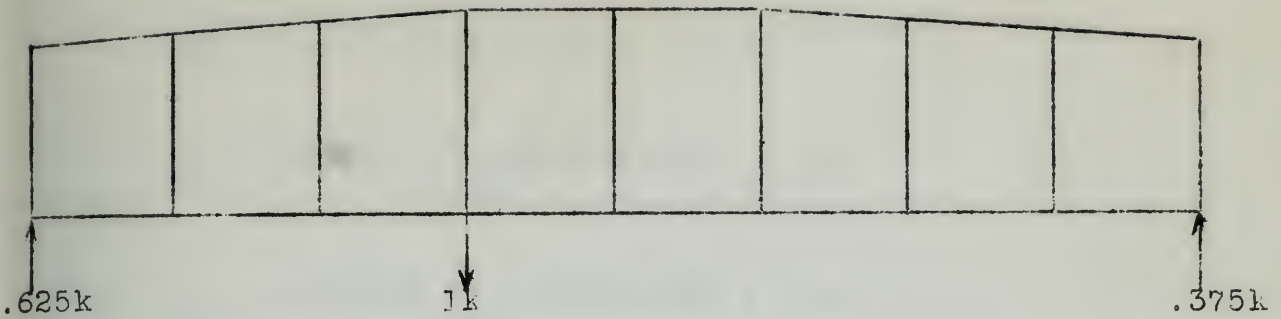
$$Q_{R6} = -0.62$$

Panel 7

$$-Q_G = -2.62$$

$$-Q_H = -2.50$$

$$Q_{R7} = -0.87$$



.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.625	.625	.625	-.375	-.375	-.375	-.375	-.375
18.75	37.5	56.25	45.0	-45.0	-33.75	-22.5	-11.25

Panel 1

Formulae (110f)&(122a) modified by the application of constants for terms involving only M, n, K₁, and K₂. These constants found and checked in solution for two previous loadings.

$$-Q_A = (-.222)(.0866 \times 18.75 - .625 \times 30) = 3.81$$

$$-Q_B = \frac{(.625 \times 30 - .0866 \times 18.75)}{3.82} = 4.49$$

$$Q_{R1} = \frac{(.625 \times 30 - .0482 \times 56.25)}{7.64} = 2.24$$

Panel 2

$$-Q_B = (-.243)(.0443 \times 37.5 - .625 \times 30) = 4.16$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{3.92} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{11.77} = 1.48$$

... ..

Panel 3

$$-Q_C = (-.25)(.0482 \times 56.25 - .625 \times 30) = 4.02$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{(3.90)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{15.60} = 1.03$$

Panel 4

$$-Q_D = (-.25)(0 - .375 \times 30) = -2.81$$

$$-Q_E = \frac{(-.375 \times 30 - 0)}{4} = -2.81$$

$$Q_{R4} = \frac{(-.375 \times 30 - 0)}{4 \times 4} = -.70$$

Panel 5

$$-Q_E = -3.75$$

$$-Q_F = -3.75$$

$$Q_{R5} = -0.938$$

Panel 6

$$-Q_F = -3.288$$

$$-Q_G = -3.204$$

$$Q_{R6} = -0.82$$

Panel 7

$$-Q_G = -3.496$$

$$-Q_H = -3.332$$

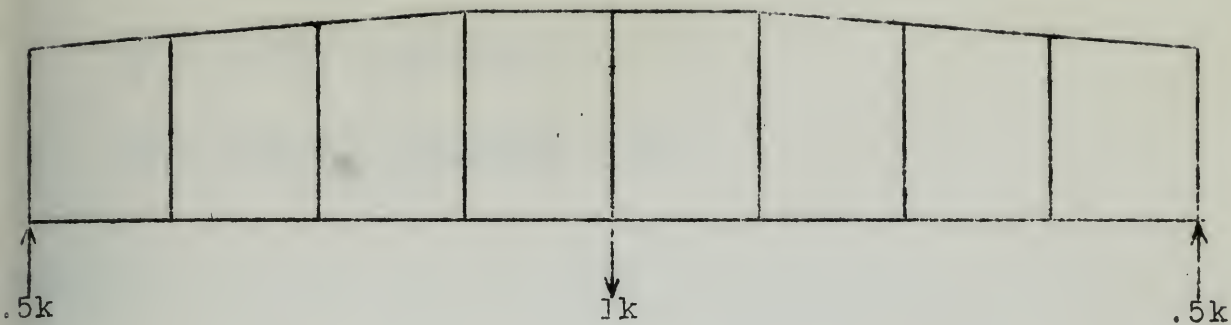
$$Q_{R7} = -1.164$$

Panel 8

$$-Q_H = -3.584$$

$$-Q_I = -2.908$$

$$Q_{R8} = -1.792$$



.0866	.0482	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.5	.5	.5	.5	-.5	-.5	-.5	-.5
15	30	45	60	-60	-45	-30	-15

Panel 1

$$-Q_A = (-.222)(.0866 \times 15 - .5 \times 30) = 3.04$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{3.82} = 3.59$$

$$Q_{R1} = \frac{(.5 \times 30 - .0866 \times 15)}{7.64} = 1.79$$

Panel 2

$$-Q_B = (-.243)(.0443 \times 30 - .5 \times 30) = 3.32$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{3.92} = 3.49$$

$$Q_{R2} = \frac{(.5 \times 30 - .0443 \times 30)}{11.76} = 1.16$$

Panel 3

$$-Q_C = (-.25)(.0482 \times 45 - .5 \times 30) = 3.21$$

$$-Q_D = \left(\frac{.5 \times 30 - .0482 \times 45}{3.90} \right) = 3.30$$

$$Q_{R3} = \left(\frac{.5 \times 30 - .0482 \times 45}{15.60} \right) = .82$$

Panel 4

$$-Q_D = (-.25)(0 - .5 \times 30) = 3.75$$

$$-Q_E = \left(\frac{.5 \times 30 - 0}{4} \right) = 3.75$$

$$Q_{R4} = \left(\frac{.5 \times 30 - 0}{4 \times 4} \right) = .94$$

Panel 5

$$-Q_E = -2.31$$

$$-Q_F = -2.81$$

$$Q_{R5} = -0.70$$

Panel 6

$$-Q_F = -2.47$$

$$-Q_G = -2.40$$

$$Q_{R6} = -0.62$$

Panel 7

$$-Q_G = -2.62$$

$$-Q_H = -2.50$$

$$Q_{R7} = -0.87$$

Panel 8

$$-Q_H = -2.18$$

$$-Q_I = -2.67$$

$$Q_{R8} = -1.34$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. The second part is devoted to a detailed analysis of the results.

3. The third part is devoted to a discussion of the conclusions.

4. The fourth part is devoted to a discussion of the future work.

5. The fifth part is devoted to a discussion of the references.

6. The sixth part is devoted to a discussion of the appendix.

7. The seventh part is devoted to a discussion of the figures.

8. The eighth part is devoted to a discussion of the tables.

9. The ninth part is devoted to a discussion of the bibliography.

10. The tenth part is devoted to a discussion of the index.

11. The eleventh part is devoted to a discussion of the summary.

12. The twelfth part is devoted to a discussion of the conclusion.

13. The thirteenth part is devoted to a discussion of the appendix.

14. The fourteenth part is devoted to a discussion of the figures.

15. The fifteenth part is devoted to a discussion of the tables.

INFLUENCE LINES - JOINT CONSTANTS

LOAD AT B

Panel 1

$$\left[1.5x4 + 2 + \frac{(3-.0866)(.0942x4-2)}{2(2-.0866)} \right] A + \left[1 + \frac{(3-.17)(.0942x4-2)}{2(2-.0866)} \right] B = -Q$$

$$6.77A - .25B = 5.32$$

$$\left[2 + 1.5 \times 3 - \frac{(3-.17)2}{2(2-.0866)} \right] B + \left[\frac{2}{3} - \frac{(3-.0866)2}{2(2-.0866)} \right] A = -Q_B$$

$$5.02B - .52A = 6.27$$

Solving Simultaneously

$$A = 0.82$$

$$B = 1.33$$

$$R_1 = \frac{(3-.0866).82 + (3-.17)1.33 + 3.14}{2(2-.0866)} = 4.76$$

Panel 2

$$\left[1.5x3 + 3 + \frac{(3-.0443)(.0463x3-3)}{2(2-.0443)} \right] B + \left[\frac{3}{2} + \frac{(3-.09)(.0463x3-3)}{2(2-.0443)} \right] C = -Q_B$$

$$5.34B - .62C = -1.16$$

$$\left[3 + 1.5x2 - \frac{(3-.0886)3}{2(2-.0443)} \right] C + \left[\frac{3}{2} - \frac{(3-.0443)3}{2(2-.0443)} \right] B = -Q_C$$

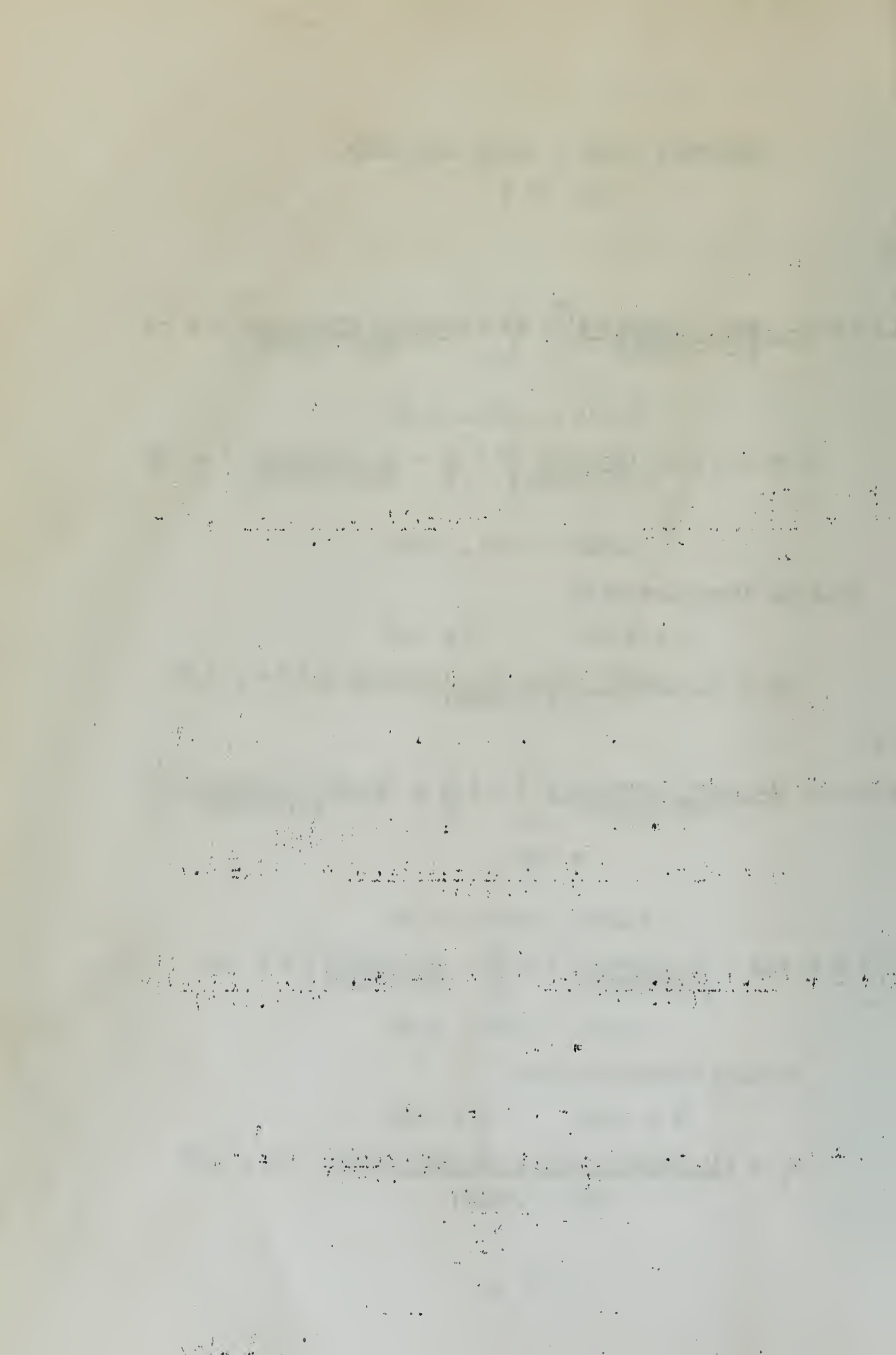
$$3.77C - .76B = -1.21$$

Solving Simultaneously

$$B = -.26$$

$$C = -.37$$

$$R_2 = \frac{(3-.0443)(-.26) + (3-.09)(-.37) - .40}{2(2-.0443)} = -.87$$



Panel 3

$$\left[1.5x2 + 4 + \frac{(3 - .0482)(.0507x2 - 4)}{2(2 - .0482)} \right] C + \left[2 + \frac{(3 - .0964)(.0507x2 - 4)}{2(2 - .0482)} \right] D = -Q_C$$

$$4.05 C - .9 D = -1.16$$

$$\left[4 + 1.5 - \frac{(3 - .0964)4}{2(2 - .0482)} \right] D + \left[2 - \frac{(3 - .0482)4}{2(2 - .0482)} \right] C = -Q_D$$

$$2.53 D - 1.02 C = 1.19$$

Solving Simultaneously

$$\begin{aligned} C &= -.43 \\ D &= -.64 \end{aligned}$$

$$R_3 = \frac{(3 - .0482)(-.43) + (3 - .0964)(-.64)}{2(2 - .0482)} - .30 = -1.10$$

Panel 4

$$\left[1.5x1 + 4 + \frac{3(-4)}{4} \right] D + \left[2 + \frac{3(-4)}{4} \right] E = -Q_D$$

$$2.5 D - 1 E = -.94$$

$$\left[4 + 1.5x1 - \frac{3x4}{4} \right] E + \left[2 - \frac{3x4}{4} \right] D = -Q_E$$

$$2.5 E - 1 D = -.94$$

Solving Simultaneously

$$\begin{aligned} D &= -.63 \\ E &= -.63 \end{aligned}$$

$$R_4 = \frac{3(-.63) + 3(-.63)}{4} - .23 = -1.18$$

Panel 5

$$\left[1.5 \times 1 + \frac{4}{4} \right] F - \frac{4}{4} E = -.94$$

$$\left[1.5 \times 1 + \frac{4}{4} \right] E - \frac{4}{4} F = -.94$$

$$E = -.63$$

$$F = -.63$$

$$R_5 = \frac{3}{4} (-.63 - .63) - .23 = -.94 - .23 = -1.17$$

Panel 6

$$\left[1.5 \times 2 + 4 + \frac{(3 - .0482)(.0507 \times 2 - 4)}{2(2 - .0482)} \right] G$$

$$+ \left[\frac{4}{2} + \frac{(3 - 2 \times .0482)(.0507 \times 2 - 4)}{2(2 - .0482)} \right] F = -.80$$

$$4.06 G - 0.89 F = -.80$$

$$\left[4 + 1.5 \times 1 - \frac{(3 - 2 \times .0482)4}{2(2 - .0482)} \right] F + \left[\frac{4}{2} - \frac{(3 - .0482)4}{2(2 - .0482)} \right] G = -.82$$

$$2.53 F - 1.02 G = -.82$$

Solving Simultaneously

$$F = -.47$$

$$G = -.30$$

$$R_6 = \frac{-(3 - .0482) \times .30 - (3 - 2 \times .0482) \times .47}{2(2 - .0482)} - .21 = -.78$$

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Panel 7

$$\left[1.5 \times 3 + 3 + \frac{(3-.0443)(.0463 \times 3 - 3)}{2(2-.0443)} \right] H$$

$$+ \left[\frac{3}{2} + \frac{(3-2 \times .0443)(.0463 \times 3 - 3)}{2(2-.0443)} \right] G = -0.83$$

$$5.34 H - .62 G = -.83$$

$$\left[3 + 1.5 \times 2 - \frac{(3-2 \times .0443)3}{2(2-.0443)} \right] G + \left[\frac{3}{2} - \frac{(3-.0433)3}{2(2-.0433)} \right] H = -.87$$

$$3.77 G - .76 H = -.87$$

Solving Simultaneously

$$G = -.27$$

$$H = -.19$$

$$R_7 = - \frac{(3-.0443) \times .19 + (3-2 \times .0443) \times -.27}{2(2-.0443)} - 0.29 = -.63$$

Panel 8

$$\left[1.5 \times 4 + 2 + \frac{(3-.0866)(.0942 \times 4 - 2)}{2(2-.0866)} \right] I + \left[\frac{2}{2} + \frac{(3-2 \times .0866)(.0942 \times 4 - 2)}{2(2-.0866)} \right] H$$

$$= -.73$$

$$6.77 I - .20 H = -.73$$

$$\left[2 + 1.5 \times 3 - \frac{(3-2 \times .0866)2}{2(2-.0866)} \right] H + \left[\frac{2}{2} - \frac{(3-.0866)2}{2(2-.0866)} \right] I$$

$$5.02 H - .52 I = -.49$$

Solving Simultaneously

$$H = -0.21$$

$$I = -0.11$$

$$R_8 = - \frac{(3-.0866) \times .11 - (3-2 \times .0866) \times -.21}{2(2-.0861)} - 0.49 = .73$$

1. The first part of the paper is devoted to the study of the properties of the function $f(x)$ defined by the equation

$$f(x) = \frac{1}{2} \left(\frac{1}{x} + \frac{1}{x+1} \right)$$

for $x > 0$. It is shown that the function $f(x)$ is strictly decreasing and convex.

2. In the second part, the author considers the problem of finding the minimum value of the function $f(x)$ on the interval $[0, 1]$.

$$\text{The minimum value of } f(x) \text{ is attained at } x = \frac{1}{2}.$$

3. The third part of the paper is devoted to the study of the properties of the function $g(x)$ defined by the equation

$$g(x) = \frac{1}{2} \left(\frac{1}{x} + \frac{1}{x+1} \right) + \frac{1}{2} \left(\frac{1}{x+1} + \frac{1}{x+2} \right)$$

for $x > 0$. It is shown that the function $g(x)$ is strictly decreasing and convex.

4. The fourth part of the paper is devoted to the study of the properties of the function $h(x)$ defined by the equation

$$h(x) = \frac{1}{2} \left(\frac{1}{x} + \frac{1}{x+1} \right) + \frac{1}{2} \left(\frac{1}{x+1} + \frac{1}{x+2} \right) + \frac{1}{2} \left(\frac{1}{x+2} + \frac{1}{x+3} \right)$$

$$\text{The minimum value of } h(x) \text{ is attained at } x = \frac{1}{3}.$$

5. The fifth part of the paper is devoted to the study of the properties of the function $k(x)$ defined by the equation

$$k(x) = \frac{1}{2} \left(\frac{1}{x} + \frac{1}{x+1} \right) + \frac{1}{2} \left(\frac{1}{x+1} + \frac{1}{x+2} \right) + \frac{1}{2} \left(\frac{1}{x+2} + \frac{1}{x+3} \right) + \frac{1}{2} \left(\frac{1}{x+3} + \frac{1}{x+4} \right)$$

$$\text{The minimum value of } k(x) \text{ is attained at } x = \frac{1}{4}.$$

6. The sixth part of the paper is devoted to the study of the properties of the function $l(x)$ defined by the equation

$$l(x) = \frac{1}{2} \left(\frac{1}{x} + \frac{1}{x+1} \right) + \frac{1}{2} \left(\frac{1}{x+1} + \frac{1}{x+2} \right) + \frac{1}{2} \left(\frac{1}{x+2} + \frac{1}{x+3} \right) + \frac{1}{2} \left(\frac{1}{x+3} + \frac{1}{x+4} \right) + \frac{1}{2} \left(\frac{1}{x+4} + \frac{1}{x+5} \right)$$

$$\text{The minimum value of } l(x) \text{ is attained at } x = \frac{1}{5}.$$

7. The seventh part of the paper is devoted to the study of the properties of the function $m(x)$ defined by the equation

$$m(x) = \frac{1}{2} \left(\frac{1}{x} + \frac{1}{x+1} \right) + \frac{1}{2} \left(\frac{1}{x+1} + \frac{1}{x+2} \right) + \frac{1}{2} \left(\frac{1}{x+2} + \frac{1}{x+3} \right) + \frac{1}{2} \left(\frac{1}{x+3} + \frac{1}{x+4} \right) + \frac{1}{2} \left(\frac{1}{x+4} + \frac{1}{x+5} \right) + \frac{1}{2} \left(\frac{1}{x+5} + \frac{1}{x+6} \right)$$

$$\text{The minimum value of } m(x) \text{ is attained at } x = \frac{1}{6}.$$

$$\text{The minimum value of } n(x) \text{ is attained at } x = \frac{1}{7}.$$

Influence Lines - Joint Constants

Load at C

Panel 1

$$6.77A - .2 B = 4.56$$

$$-.52A + 5.02B = 5.38$$

Solving Simultaneously

$$A = .71$$

$$B = 1.14$$

$$R_1 = \frac{(3 - .0866) \cdot .71 + (3 - .17) \cdot 1.14}{2(2 - .0866)} + 2.69 = 4.07$$

Panel 2

$$5.34B - .62C = 4.98$$

$$3.77C - .76B = 5.23$$

Solving Simultaneously

$$B = 1.14$$

$$C = 1.62$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0886)C}{2(2 - .0443)} + 1.76 = 3.80$$

Panel 3

$$4.05C - .9 D = -2.23$$

$$2.53D - 1.02C = -1.19$$

Solving Simultaneously

$$C = -.72$$

$$D = -.76$$

$$R_3 = \frac{(3 - .0482)(-.72) + (3 - .0964)(-.76)}{2(2 - .0482)} - .59 = -1.70$$

Panel 4

$$2.5D - 1E = -1.87$$

$$2.5E - 1D = -1.87$$

Solving Simultaneously

$$D = -1.25$$

$$E = -1.25$$

$$R_4 = \frac{3(-1.25) + 3(-1.25)}{4} - .47 = -2.34$$

Panel 5

$$E = -1.25$$

$$F = -1.25$$

$$R_5 = -2.34$$

Panel 6

$$F = -0.94$$

$$G = -0.60$$

$$R_6 = -1.56$$

Panel 7

$$G = -0.54$$

$$H = -0.37$$

$$R_7 = -1.27$$

Panel 8

$$H = -0.41$$

$$I = -0.23$$

$$R_8 = -1.45$$

Influence Lines - Joint Constants

Load at D

Panel 1

$$6.77A - .2 B = 3.81$$

$$-.52A + 5.02B = 4.49$$

Solving Simultaneously

$$A = .59$$

$$B = .96$$

$$R_1 = \frac{(3 - .0866) .59 + (3 - .17) .96}{2(2 - .0866)} + 2.24 = 3.40$$

Panel 2

$$5.34B - .62C = 4.16$$

$$3.77C - .76B = 4.36$$

Solving Simultaneously

$$B = .94$$

$$C = 1.34$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0886)C}{2(2 - .0443)} + 1.48 = 3.18$$

Panel 3

$$4.05C - .9D = 4.02$$

$$2.53D - 1.02C = 4.12$$

Solving Simultaneously

$$C = 1.49$$

$$D = 2.23$$

$$R_3 = \frac{(3 - .0482)1.49 + (3 - .0964)2.23}{2(2 - .0482)} + 1.03 = 3.81$$

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Panel 4

$$2.5D - 1E = -2.81$$

$$2.5E - 1D = -2.81$$

Solving Simultaneously

$$D = -1.87$$

$$E = -1.87$$

$$R_4 = \frac{3(-1.87) + 3(-1.87)}{4} + .70 = -3.51$$

Panel 5

$$E = -1.88$$

$$F = -1.88$$

$$R_5 = -3.52$$

Panel 6

$$F = -1.41$$

$$G = -0.90$$

$$R_6 = -2.34$$

Panel 7

$$G = -0.81$$

$$H = -0.56$$

$$R_7 = -1.90$$

Panel 8

$$H = -0.62$$

$$I = -0.34$$

$$R_8 = -2.18$$

Influence Lines - Joint Constants

Load at E

Panel 1

$$6.77A - .2B = 3.04$$

$$-.52A + 5.02B = 3.59$$

Solving Simultaneously

$$A = .47$$

$$B = .76$$

$$R_1 = \frac{(3 - .0866).47 + (3 - .17).76}{2(2 - .0866)} + 1.79 = 2.71$$

Panel 2

$$5.34B - .62C = 3.32$$

$$3.77C - .76B = 3.49$$

Solving Simultaneously

$$B = .75$$

$$C = 1.08$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0866)C}{2(2 - .0433)} + 1.16 = 2.53$$

Panel 3

$$4.05C - .9D = 3.21$$

$$2.53D - 1.02C = 3.30$$

Solving Simultaneously

$$C = 1.19$$

$$D = 1.78$$

$$R_3 = \frac{(3 - .0482)1.19 + (3 - .0964)1.78}{2(2 - .0482)} + .82 = 3.04$$

Panel 4

$$2.5D - 1E = 3.75$$

$$2.5E - 1D = 3.75$$

Solving Simultaneously

$$D = 2.5$$

$$E = 2.5$$

$$R_4 = \frac{3(2.5) + 3(2.5)}{4} + .94 = 4.69$$

Panel 5

$$E = -2.50$$

$$F = -2.50$$

$$R_5 = -4.69$$

Panel 6

$$F = -1.88$$

$$G = -1.20$$

$$R_6 = -3.12$$

Panel 7

$$G = -1.08$$

$$H = -.75$$

$$R_7 = 2.53$$

Panel 8

$$H = -.83$$

$$I = -.45$$

$$R_8 = -2.91$$

1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) and (2) under the assumption that the functions $f_i(x)$ and $g_j(x)$ are continuous and satisfy certain conditions.

2. In the second part, we consider the case when the functions $f_i(x)$ and $g_j(x)$ are piecewise continuous and the system of equations (1) and (2) is solved in the sense of Carathéodory.

3. Finally, in the third part, we study the problem of the uniqueness of solutions of the system of equations (1) and (2) under the assumption that the functions $f_i(x)$ and $g_j(x)$ are continuous and satisfy certain conditions.

4. The results of the paper are summarized in the following theorem:

THEOREM 1.

Let the functions $f_i(x)$ and $g_j(x)$ be continuous and satisfy the conditions

(1) $f_i(x) \geq 0$ and $g_j(x) \geq 0$ for all $x \in [a, b]$;

(2) $f_i(x)$ and $g_j(x)$ are bounded on $[a, b]$;

then the system of equations (1) and (2) has at least one solution in the class of continuous functions.

Proof. Let us consider the system of equations (1) and (2) in the form

(3) $x' = f(x) + g(x)u$, $u' = -f(x) - g(x)u$, $x(a) = x_0$, $u(a) = u_0$,

where $f(x) = (f_1(x), \dots, f_n(x))^T$ and $g(x) = (g_1(x), \dots, g_m(x))^T$ are continuous and bounded on $[a, b]$.

Let us denote by $x(t)$ and $u(t)$ the solutions of the system (3) with initial conditions $x(a) = x_0$ and $u(a) = u_0$.

Then, according to the theorem of Carathéodory, the solutions $x(t)$ and $u(t)$ exist and are unique on the interval $[a, b]$ if the functions $f(x)$ and $g(x)$ are continuous and bounded on $[a, b]$.

Let us denote by $x(t)$ and $u(t)$ the solutions of the system (3) with initial conditions $x(a) = x_0$ and $u(a) = u_0$.

Then, according to the theorem of Carathéodory, the solutions $x(t)$ and $u(t)$ exist and are unique on the interval $[a, b]$ if the functions $f(x)$ and $g(x)$ are continuous and bounded on $[a, b]$.

THEOREM 2.

Let the functions $f_i(x)$ and $g_j(x)$ be continuous and satisfy the conditions

(1) $f_i(x) \geq 0$ and $g_j(x) \geq 0$ for all $x \in [a, b]$;

(2) $f_i(x)$ and $g_j(x)$ are bounded on $[a, b]$;

(3) the functions $f_i(x)$ and $g_j(x)$ are linearly independent on $[a, b]$;

Influence Lines - Moment Determination

Load at B

Panel 1

$$M_{AB} = 2\left(.82 + \frac{1.33}{2} - 4.76\right) = -6.56$$

$$M_{BA} = 2\left(1.33 + \frac{.82}{2} - 4.76\right) = -6.04$$

Panel 2

$$M_{BC} = 3\left(-.26 - \frac{.37}{2} + .87\right) = +1.29$$

$$M_{CB} = 3\left(-.37 - \frac{.26}{2} + .87\right) = +1.11$$

Panel 3

$$M_{CD} = 4\left(-.43 - \frac{.64}{2} + 1.10\right) = +1.40$$

$$M_{DC} = 4\left(-.64 - \frac{.43}{2} + 1.10\right) = +1.10$$

Panel 4

$$M_{DE} = 4\left(-.63 - \frac{.63}{2} + 1.18\right) = +.96$$

$$M_{ED} = 4\left(-.63 - \frac{.63}{2} + 1.18\right) = +.96$$

Panel 5

$$M_{EF} = 4\left(-.63 - \frac{.63}{2} + 1.17\right) = +0.94$$

$$M_{FE} = 4\left(-.63 - \frac{.63}{2} + 1.17\right) = +0.94$$

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AND ARCHITECTURE

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Panel 6

$$M_{FG} = 4(-.47 - \frac{.30}{2} + .78) = +0.64$$

$$M_{GF} = 4(-.30 - \frac{.47}{2} + .78) = +0.98$$

Panel 7

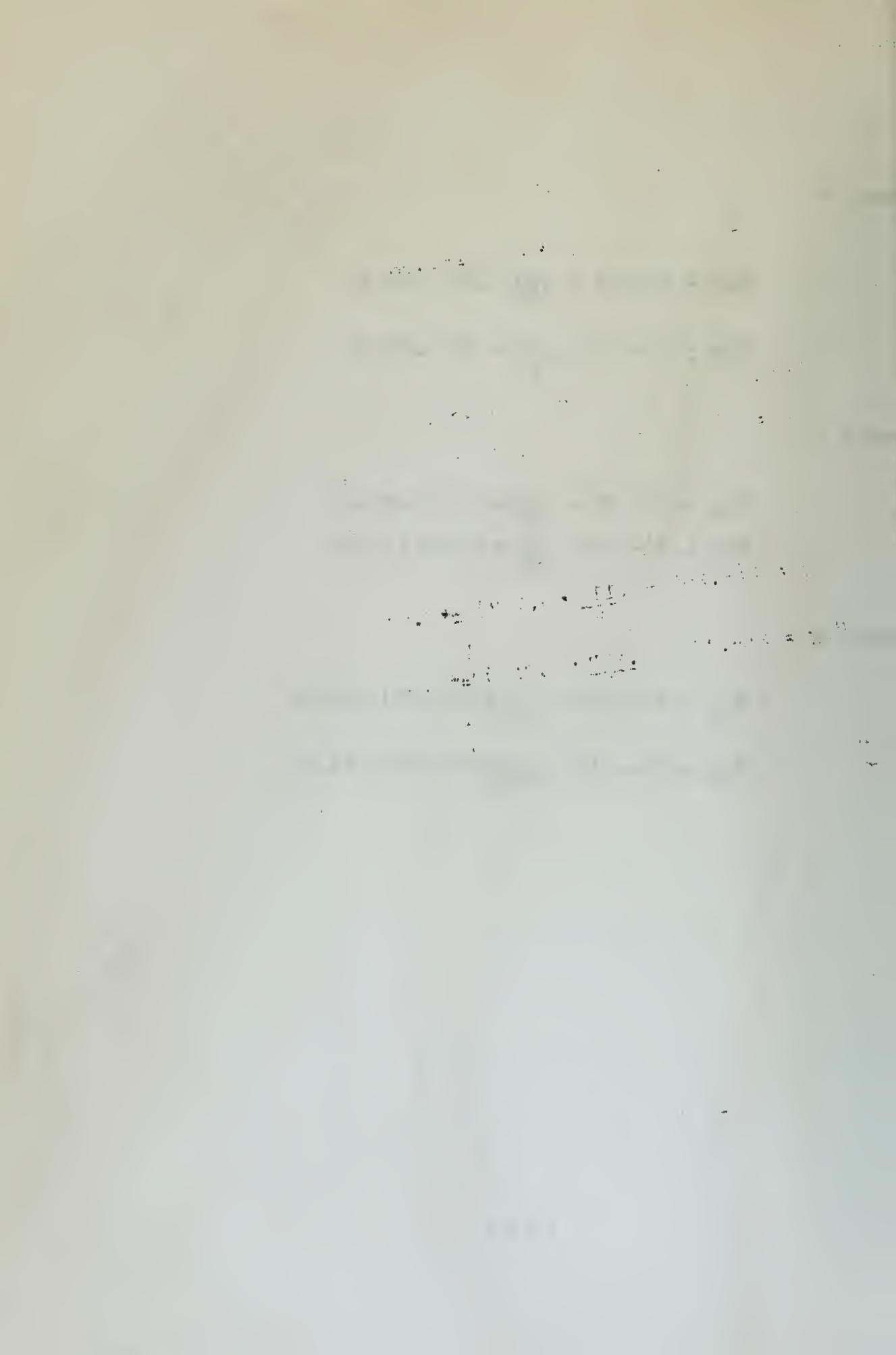
$$M_{GH} = 3(-.27 - \frac{.19}{2} + 0.63) = +0.81$$

$$M_{HG} = 3(-.19 - \frac{.27}{2} + 0.63) = +0.93$$

Panel 8

$$M_{HI} = 2(-.207 - \frac{.113}{2} + 0.727) = +0.93$$

$$M_{IH} = 2(-.113 - \frac{.207}{2} + 0.727) = +1.02$$



Influence Lines - Moment Determination

Load at C

Panel 1

$$M_{AB} = 2\left(\cancel{.71} + \frac{1.14}{2} - 4.07\right) = -5.58$$

$$M_{BA} = 2\left(1.14 + \frac{\cancel{.71}}{2} - 4.07\right) = -5.16$$

Panel 2

$$M_{BC} = 3\left(1.14 + \frac{1.62}{2} - 3.80\right) = -5.55$$

$$M_{CB} = 3\left(1.62 + \frac{1.14}{2} - 3.80\right) = -4.83$$

Panel 3

$$M_{CD} = 4\left(\cancel{-.72} - \frac{.76}{2} + 1.70\right) = \cancel{+}2.40$$

$$M_{DC} = 4\left(\cancel{-.76} - \frac{.72}{2} + 1.70\right) = \cancel{+}2.32$$

Panel 4

$$M_{DE} = 4\left(\cancel{-1.25} - \frac{1.25}{2} + 2.34\right) = \cancel{+}1.88$$

$$M_{ED} = 4\left(\cancel{-1.25} - \frac{1.25}{2} + 2.34\right) = \cancel{+}1.88$$

Panel 5

$$M_{EF} = 1.88$$

$$M_{FE} = 1.88$$

Panel 6

$$M_{FG} = 1.29$$

$$M_{GF} = 1.96$$

Panel 7

$$M_{GH} = 1.62$$

$$M_{HG} = 1.87$$

Panel 8

$$M_{HI} = 1.85$$

$$M_{IH} = 2.04$$

Influence Lines - Moment Determination

Load at D

Panel 1

$$M_{AB} = 2(.59 + \frac{.96}{2} - 3.40) = -4.66$$

$$M_{BA} = 2(.96 + \frac{.59}{2} - 3.40) = -4.30$$

Panel 2

$$M_{BC} = 3(.94 + \frac{1.34}{2} - 3.18) = -4.71$$

$$M_{CB} = 3(1.34 + \frac{.94}{2} - 3.18) = -4.11$$

Panel 3

$$M_{CD} = 4(1.49 + \frac{2.23}{2} - 3.81) = -4.84$$

$$M_{DC} = 4(2.23 + \frac{1.49}{2} - 3.81) = -3.36$$

Panel 4

$$M_{DE} = 4(-1.87 - \frac{1.87}{2} + 3.51) = +2.84$$

$$M_{ED} = 4(-1.87 - \frac{1.87}{2} + 3.51) = +2.84$$

Panel 5

$$M_{EF} = 2.81$$

$$M_{FE} = 2.81$$

Panel 6

$$M_{FG} = 1.93$$

$$M_{GF} = 2.94$$

Panel 7

$$M_{GH} = 2.43$$

$$M_{HG} = 2.80$$

Panel 8

$$M_{HI} = 2.78$$

$$M_{IH} = 3.06$$

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Influence Lines - Moment Determination

Load at E

Panel 1

$$M_{AB} = 2(.47 + \frac{.76}{2} - 2.79) = -3.88$$

$$M_{BA} = 2(.76 + \frac{.47}{2} - 2.79) = -3.60$$

Panel 2

$$M_{BC} = 3(.75 + \frac{1.08}{2} - 2.53) = -3.72$$

$$M_{CB} = 3(1.08 + \frac{.75}{2} - 2.53) = -3.24$$

Panel 3

$$M_{CD} = 4(1.19 + \frac{1.78}{2} - 3.04) = -3.84$$

$$M_{DC} = 4(1.78 + \frac{1.19}{2} - 3.04) = -2.68$$

Panel 4

$$M_{DE} = 4(2.5 + \frac{2.5}{2} - 4.69) = -3.76$$

$$M_{ED} = 4(2.5 + \frac{2.5}{2} - 4.69) = -3.76$$

Panel 5

$$M_{EF} = 3.75$$

$$M_{FE} = 3.75$$

Panel 6

$$M_{FG} = 2.58$$

$$M_{GF} = 3.92$$

Panel 7

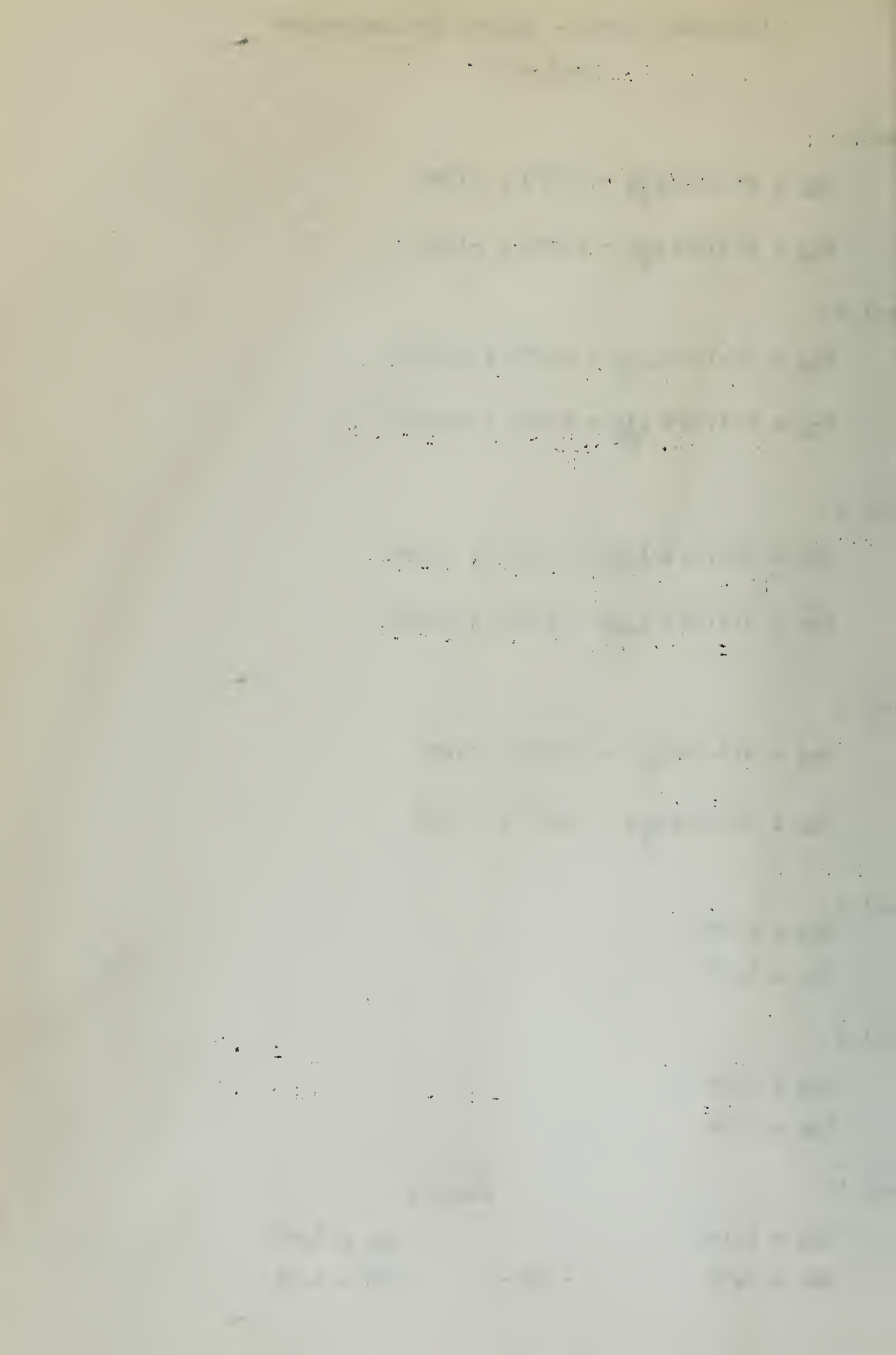
$$M_{GH} = 3.24$$

$$M_{HG} = 3.73$$

Panel 8

$$M_{HI} = 3.60$$

$$M_{IH} = 4.08$$



First Moment Corrections - Load at B

Panel 1

$$6.77A - .20B = 0 \quad A = -.01$$

$$-0.52A + 5.02B = -1.29 \quad B = -.25$$

$$R_1 = \frac{-2.91 \times .01 - 2.83 \times .25}{3.83} = -.19$$

$$M_{AB} = 2(-.01 - \frac{.25}{2} + .19) = .12$$

$$M_{BA} = 2(-.25 - \frac{.01}{2} + .19) = -.12$$

Panel 2

$$5.34B - .63C = 6.04 \quad B = 1.11$$

$$-0.77B + 3.77C = -1.40 \quad C = -0.14$$

$$R_2 = \frac{2.96 \times 1.11 - 2.91 \times .14}{3.91} = .74$$

$$M_{BC} = 2(1.11 - \frac{.14}{2} + 0.74) = .60$$

$$M_{CB} = 2(-.14 + \frac{1.11}{2} + 0.74) = -.64$$

Panel 3

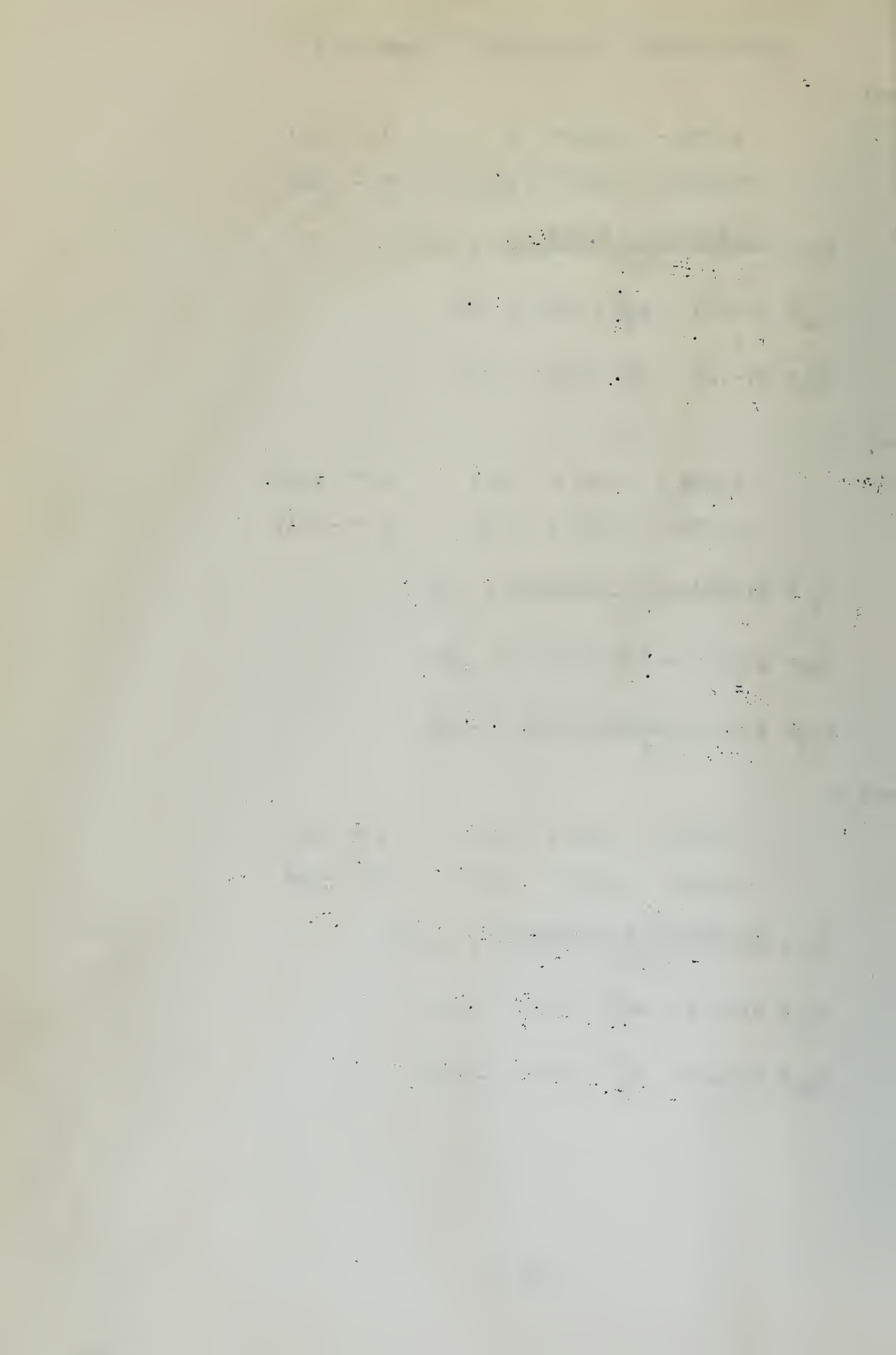
$$4.06C - .89D = -1.11 \quad C = -.39$$

$$-1.02C + 2.53D = -.96 \quad D = -.54$$

$$R_3 = \frac{-2.95 \times .39 - 2.90 \times .54}{3.90} = -.70$$

$$M_{CD} = 3(-.39 - \frac{.54}{2} + .70) = .12$$

$$M_{DC} = 3(-.54 - \frac{.39}{2} + .70) = -.12$$



Panel 4

$$\begin{aligned}2.5 D - E &= -1.10 \\ -0 + 2.5 E &= -.96 \\ D &= -.71 \\ E &= -.67\end{aligned}$$

$$R_4 = \frac{3}{4} (-.67 - .71) = -1.03$$

$$M_{DE} = 4(-.71 - \frac{.67}{2} + 1.03) = -.08$$

$$M_{ED} = 4(-.67 - \frac{.71}{2} + 1.03) = .04$$

Panel 5

$$\begin{aligned}2.5 E - F &= -.64 \\ -E + 2.5 F &= -.96 \\ E &= -.49 \\ F &= -.58\end{aligned}$$

$$R_5 = \frac{3}{4} (-.58 - .49) = -.80$$

$$M_{EF} = 4(-.49 - \frac{.58}{2} + .80) = .08$$

$$M_{FE} = 4(-.58 - \frac{.49}{2} + .80) = -.12$$

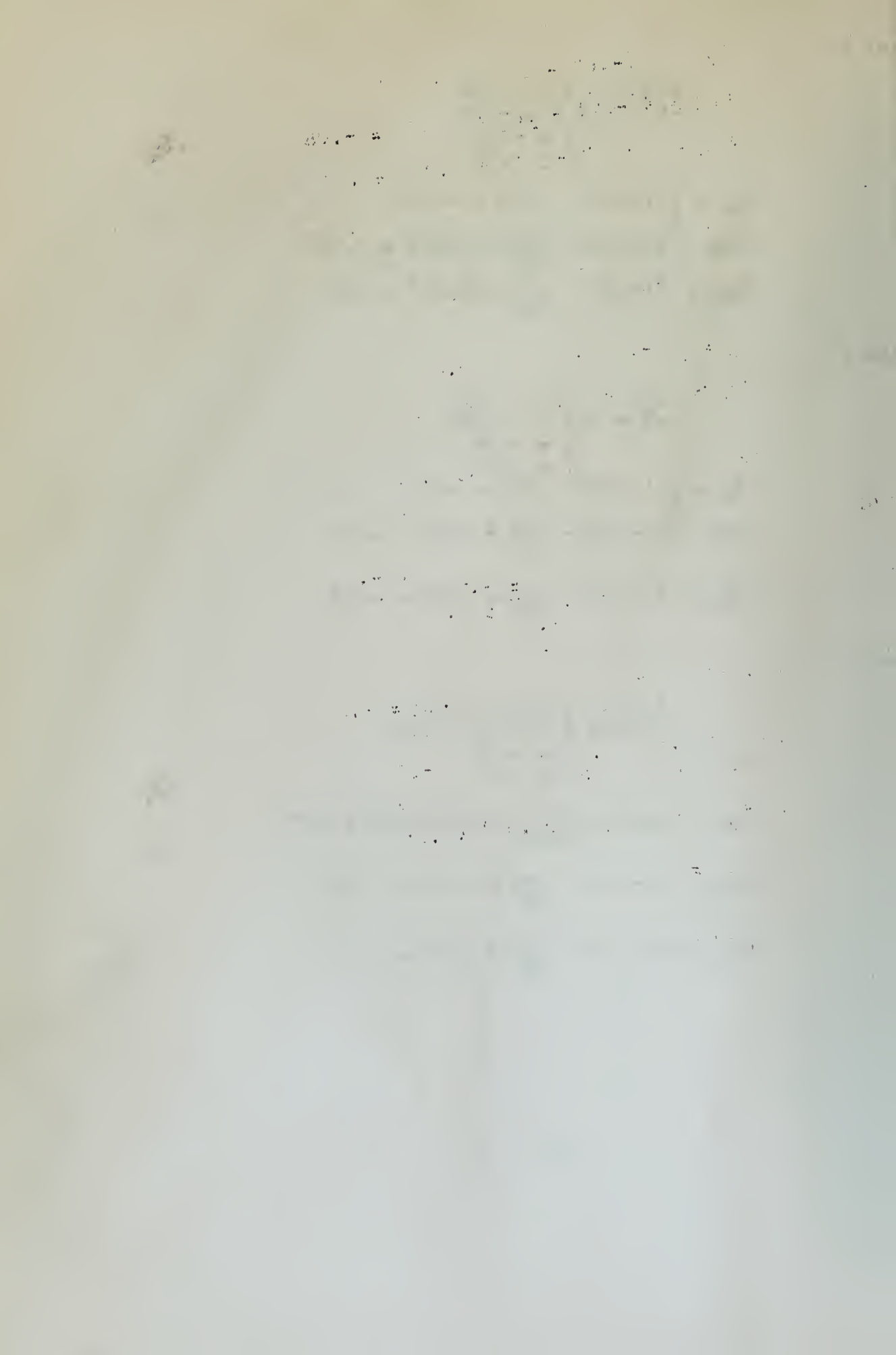
Panel 6

$$\begin{aligned}4.06 - 0.89 F &= -.81 \\ -1.026 + 2.53 F &= -.96 \\ F &= -.50 \\ G &= -.31\end{aligned}$$

$$R_6 = \frac{-2.95 \times .31 - 2.90 \times .50}{3.90} = -.61$$

$$M_{FG} = 3(-.50 - \frac{.31}{2} + .61) = -.15$$

$$M_{GF} = 3(-.31 - \frac{.50}{2} + .61) = .15$$



Panel 7

$$\begin{aligned}5.34 H - 0.63 G &= -.93 \\-0.77 H + 3.77 G &= -.98 \\G &= -.30 \\H &= -.21\end{aligned}$$

$$R_7 = \frac{-2.96 \times .21 - 2.91 \times .3}{3.91} = -.38$$

$$M_{GH} = 2(-.30 - \frac{.21}{2} + .38) = -.06$$

$$M_{HG} = 2(-.21 - \frac{.30}{2} + .38) = .06$$

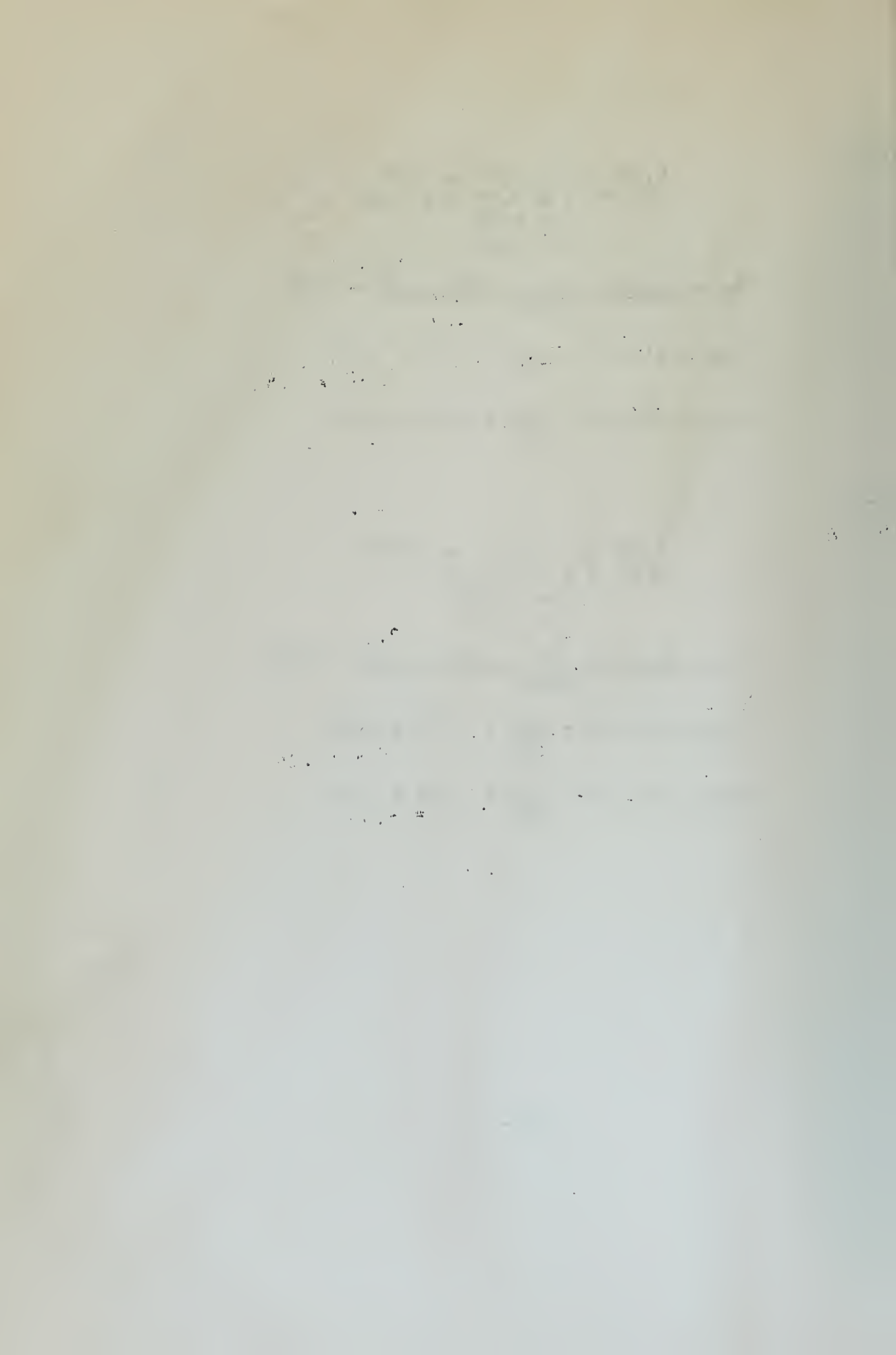
Panel 8

$$\begin{aligned}5.02 H - 0.52 I &= -.0.93 \\-0.20 H + 6.77 I &= 0 \\H &= -0.19 \\I &= -0.01\end{aligned}$$

$$R_8 = \frac{-2.91 \times .01 - 2.83 \times .19}{3.83} = -0.15$$

$$M_{HI} = 2(-.19 - \frac{.01}{2} + .15) = -.08$$

$$M_{IH} = 2(-.01 - \frac{.19}{2} + .15) = .08$$



SECOND MOMENT CORRECTIONS

Load at B

Panel 1

$$\begin{aligned} 6.77 A - 0.20 B &= 0 \\ -0.52 A + 5.02 B &= -.60 \end{aligned}$$

$$\begin{aligned} A &= 0 \\ B &= -.12 \end{aligned}$$

$$R_1 = \frac{-2.83 \times .12}{3.83} = -.09$$

$$M_{AB} = 2\left(0 - \frac{.12}{2} + .09\right) = .06$$

$$M_{BA} = 2(-.12 + .09) = -.06$$

Panel 2

$$5.34 B - 0.63 C = -.12$$

$$-0.77 B + 3.77 C = .12$$

$$B = .03$$

$$C = .04$$

$$R_2 = \frac{-2.96 \times .03 - 2.91 \times .04}{3.91} = -.05$$

$$M_{BC} = 2(-.03 - \frac{.04}{2} + .05) = 0$$

$$M_{CB} = 2(-.04 - \frac{.03}{2} + .05) = -.01$$

Load at PP1

	Panel	1		2		3		4	
		A	B	B	C	C	D	D	E
Initial Values	-Q	+5.32	+6.27	-1.16	-1.21	-1.16	-1.19	-0.94	-0.94
	∞	+1.31	+1.33	-0.26	-0.37	-0.43	-0.64	-0.63	-0.63
	R	+4.76		-0.87		-1.10		-1.18	
	M'	-6.56	-6.04	+1.29	+1.11	+1.40	+1.10	+0.96	+0.96
First Incre- ment	-Q	+0.00	-1.29	+6.04	-1.40	-1.11	-0.96	-1.10	-0.96
	∞	-0.01	-0.25	+1.11	-0.14	-0.39	-0.54	-0.71	-0.67
	R	-0.19		+0.74		-0.70		-1.03	
	M'	+0.12	-0.12	+0.60	-0.64	+ .12	- .12	- .08	+ .04
	-Q	+0.00	-0.60	-0.12	-0.12	+0.64	-0.04	+0.12	+0.12
	∞	+0.00	-0.12	-0.03	-0.04				
	R	-0.09		-0.05					
	M'	+0.06	-0.06	+0.00	-0.01	-	-	-	-
	M	-6.38	-6.22	+1.89	+0.46	+1.52	+0.98	+0.88	+1.00

	5		6		7		8	
	E	F	F	G	G	H	H	I
-Q	-0.94	-0.94	-0.82	-0.80	-0.87	-0.83	-0.90	-0.73
α	-0.63	-0.63	-0.47	-0.30	-0.27	-0.19	-0.21	-0.11
R	-1.18		-0.78		-0.63		-0.73	
M	+0.96	+0.96	+0.64	+0.98	+0.81	+0.93	+0.93	+1.02
-Q	-0.96	-0.64	-0.96	-0.81	-0.98	-0.93	-0.93	+0.00
α	-0.49	-0.58	-0.50	-0.31	-0.30	-0.21	-0.19	-0.01
R	-0.80		-0.61		-0.38		-0.15	
M'	+0.08	-0.12	-0.15	+0.15	-0.06	+0.06	-0.08	+0.08
	+0.08	+0.15	+0.12	+0.06	-0.15	+0.08	-0.06	
	-	-	-	-	-	-	-	-
	+1.04	+0.84	+0.49	+1.13	+0.75	+0.99	+0.85	+1.10

First Moment Corrections

Load at C

Panel 1

$$6.77A - 0.20B = 0$$

$$-0.52A + 5.02B = 5.55$$

$$A = .33$$

$$B = 1.11$$

$$R_1 = \frac{2.91 \times .33 + 2.83 \times 1.11}{3.33} = 1.07$$

$$M_{AB} = 2\left(.33 + \frac{1.11}{2} - 1.07\right) = -.36$$

$$M_{BA} = 2\left(1.11 + \frac{.33}{2} - 1.07\right) = .40$$

Panel 2

$$5.34B - 0.63C = 5.16$$

$$-0.77B + 3.77C = -2.40$$

$$B = .91$$

$$C = -.45$$

$$R_2 = \frac{2.96 \times .91 - 2.91 \times .45}{3.91} = .35$$

$$M_{BC} = 2\left(.91 - \frac{.45}{2} - .35\right) = 1.02$$

$$M_{CB} = 2\left(-.45 + \frac{.91}{2} - .35\right) = -1.05$$

Panel 3

$$4.06C - 0.89D = 4.83$$

$$-1.02C + 2.53D = -1.88$$

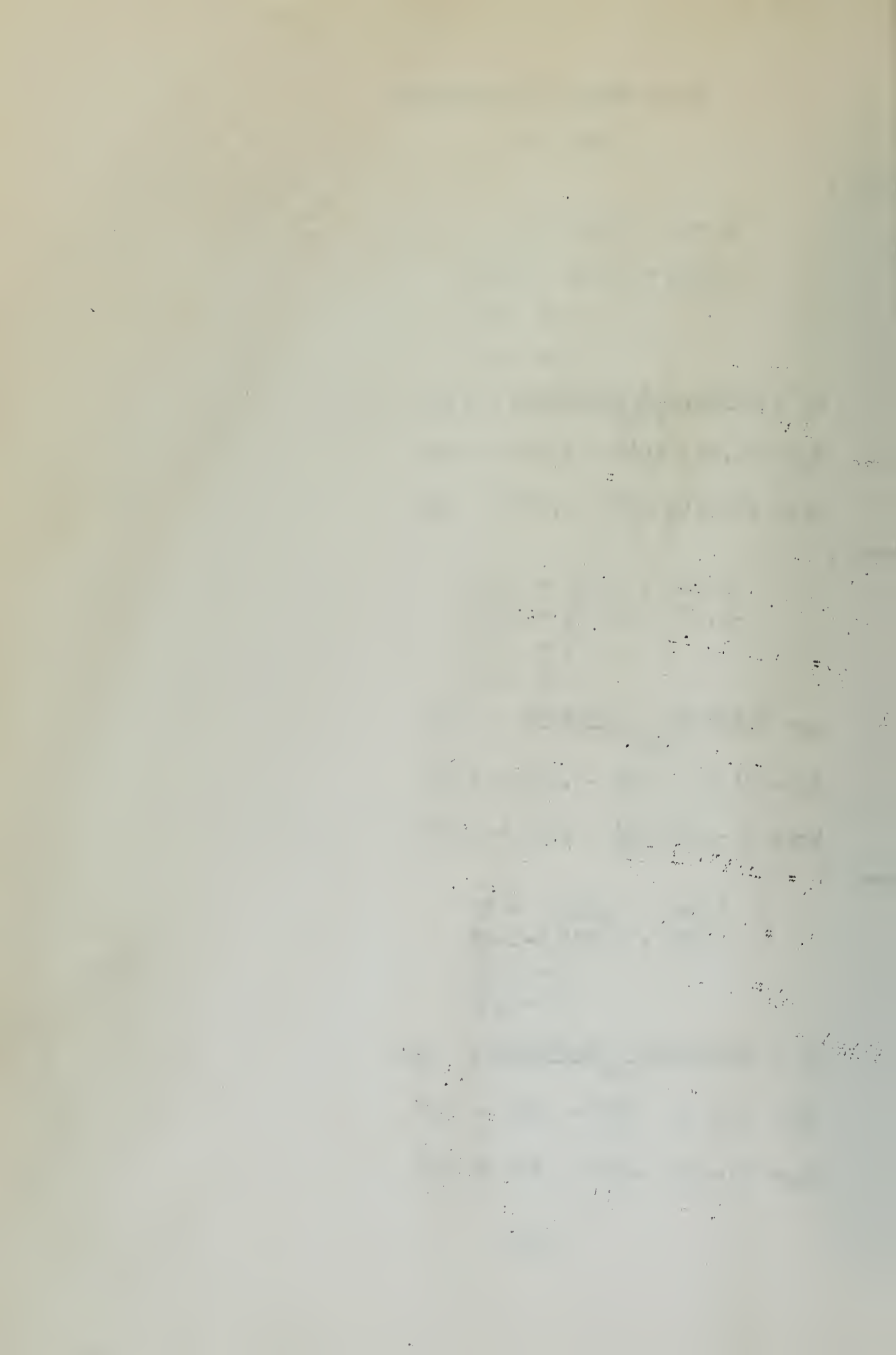
$$C = 1.13$$

$$D = -0.29$$

$$R_3 = \frac{2.95 \times 1.13 - 2.90 \times .29}{3.90} = .64$$

$$M_{CD} = 3\left(1.13 - \frac{.29}{2} - .64\right) = 1.08$$

$$M_{DC} = 3\left(-.29 + \frac{1.13}{2} - .64\right) = -1.08$$



Panel 4

$$\begin{aligned} 2.5D - E &= -2.32 \\ -D + 2.5E &= -1.88 \\ D &= -1.34 \\ E &= -1.46 \end{aligned}$$

$$R_4 = \frac{3}{4}(-1.34 - 1.46) = -2.10$$

$$M_{DE} = 4(-1.34 - \frac{1.46}{2} + 2.10) = .12$$

$$M_{ED} = 4(-1.46 - \frac{1.34}{2} + 2.10) = -.12$$

Panel 5

$$\begin{aligned} 2.5E - F &= -1.88 \\ -E + 2.5F &= -1.29 \\ E &= -1.14 \\ F &= -.97 \end{aligned}$$

$$R_5 = \frac{3}{4}(-1.14 - .97) = -1.58$$

$$M_{EF} = 4(-1.14 - \frac{.97}{2} + 1.58) = -.16$$

$$M_{FE} = 4(-.97 - \frac{1.14}{2} + 1.58) = .16$$

Panel 6

$$\begin{aligned} 2.53F - 1.02G &= -1.88 \\ -0.89F + 4.06G &= -1.62 \\ F &= -.99 \\ G &= -.62 \end{aligned}$$

$$R_6 = \frac{-2.95 \times .62 - 2.90 \times .60}{3.91} = -.77$$

$$M_{FG} = 3(-.99 - \frac{.62}{2} + .77) = -.40$$

$$M_{GF} = 3(-.62 - \frac{.99}{2} + .77) = .32$$

Panel 7

$$3.77G - 0.77H = -1.96$$

$$-0.63G + 5.34H = -1.85$$

$$G = -.60$$

$$H = -.42$$

$$R_7 = \frac{-2.91 \times .60 - 2.96 \times .42}{3.91} = -.77$$

$$M_{GH} = 2(-.60 - \frac{.42}{2} + .77) = -.12$$

$$M_{HG} = 2(-.42 - \frac{.60}{2} + .77) = .15$$

Panel 8

$$5.02H - 0.52I = -1.87$$

$$-0.20H + 6.72I = 0$$

$$H = -.37$$

$$I = -.01$$

$$R_8 = \frac{-2.83 \times .37 - 2.91 \times .01}{3.83} = -.28$$

$$M_{HI} = 2(-.37 - \frac{.01}{2} + .28) = -.18$$

$$M_{IH} = 2(-.01 - \frac{.37}{2} + .28) = .18$$

Second Moment Corrections - Load at C

Panel 1

$$\begin{aligned} 6.77A - 0.20B &= 0 \\ -0.52A + 5.02B &= -1.02 \\ A &= -.01 \\ B &= -.20 \end{aligned}$$

$$R_1 = \frac{-2.91 \times .01 - 2.83 \times .20}{3.83} = -.16$$

$$M_{AB} = 2(-.01 - \frac{.20}{2} + .16) = .10$$

$$M_{BA} = 2(-.20 - \frac{.01}{2} + .16) = -.10$$

Panel 2

$$\begin{aligned} 5.34B - 0.63C &= -.40 \\ -0.77B + 3.77C &= -1.08 \\ B &= -.11 \\ C &= -.28 \end{aligned}$$

$$R_2 = \frac{-2.96 \times .11 - 2.91 \times .28}{3.91} = -.30$$

$$M_{BC} = 2(-.11 - \frac{.28}{2} + .30) = .15$$

$$M_{CB} = 2(-.28 - \frac{.11}{2} + .30) = -.09$$

Panel 3

$$\begin{aligned} 4.06C - 0.89D &= 1.05 \\ -1.02C + 2.53D &= -.12 \\ C &= .27 \\ D &= .06 \end{aligned}$$

$$R_3 = \frac{2.95 \times .27 + 2.90 \times .06}{3.90} = .24$$

$$M_{CD} = 3(.27 + \frac{.06}{2} - .24) = .24$$

$$M_{DC} = 3(.06 + \frac{.27}{2} - .24) = -.16$$

Panel 4

$$2.5D - E = 1.08$$

$$- D + 2.5E = .16$$

$$D = .74$$

$$E = .36$$

$$R_5 = \frac{3}{4}(.74 + .36) = .82$$

$$M_{DE} = 4(.74 + \frac{.36}{2} - .82) = .40$$

$$M_{ED} = 4(.36 + \frac{.74}{2} - .82) = -.36$$

Panel 5

$$2.5E - F = .12$$

$$- E + 2.5F = .40$$

$$E = .13$$

$$F = .21$$

$$R_5 = \frac{3}{4}(.13 + .21) = .25$$

$$M_{EF} = 4(.13 + \frac{.21}{2} - .25) = -.08$$

$$M_{FE} = 4(.21 + \frac{.13}{2} - .25) = .08$$

Panel 6

$$2.53F - 1.02G = -.16$$

$$-0.89F + 4.06G = .12$$

$$F = -.06$$

$$G = .02$$

$$R_6 = \frac{-2.90 \times .06 + 2.95 \times .02}{3.90} = -.03$$

$$M_{FG} = 3(-.06 + \frac{.02}{2} + .03) = -.06$$

$$M_{GF} = 3(.02 - \frac{.06}{2} + .03) = .06$$

Panel 7

$$3.77G - 0.77H = -.32$$

$$-0.63G + 5.34H = .18$$

$$G = -.08$$

$$H = .02$$

$$R_7 = \frac{2.96 \times .02 - 2.91 \times .08}{3.91} = -.04$$

$$M_{GH} = 2(-.08 + \frac{.02}{2} + .04) = -.06$$

$$M_{HG} = 2(.02 - \frac{.08}{2} + .04) = .04$$

Panel 8

$$5.02H - 0.52I = -.15$$

$$-0.20H + 6.77I = 0$$

$$H = -.03$$

$$I = 0$$

$$R_8 = \frac{-2.83 \times .03}{3.83} = -.02$$

$$M_{HI} = 2(-.03 + .02) = -.02$$

$$M_{IH} = 2(\frac{-.03}{2} + .02) = .02$$

Load at PP2

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	4.56	5.38	4.98	5.23	-2.33	-2.38	-1.87	-1.87
×	0.71	1.14	1.14	1.62	-0.72	-0.76	-1.25	-1.25
R	4.07		3.80		-1.70		-2.34	
M'	-5.58	-5.16	-5.55	-4.83	2.40	2.32	1.88	1.88
-Q	0.00	5.55	5.16	-2.40	4.83	-1.88	-2.32	-1.88
×	0.33	1.11	0.91	-0.45	1.13	-0.29	-1.34	-1.46
R	1.07		0.35		0.64		-2.10	
M''	-0.36	0.40	1.02	-1.05	1.08	-1.08	0.12	-0.12
-Q	0.00	-1.02	-0.40	-1.08	1.05	-0.12	1.08	0.16
×	-0.01	-0.20	-0.11	-0.28	0.27	0.06	0.74	0.36
R	-0.16		-0.30		0.24		0.82	
M'''	0.10	-0.10	0.15	-0.09	0.24	-0.16	0.40	-0.36
M	-5.84	-4.81	-4.38	-5.97	3.72	1.08	2.40	1.40

1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future. The author points out that the study of history is not only a means of satisfying a natural curiosity about the past, but also a means of developing a sense of responsibility for the future.

2. The second part of the paper discusses the various methods of historical research. It is pointed out that the study of history is not a simple matter of collecting facts and dates, but a process of critical analysis and interpretation. The author discusses the various sources of historical information, such as books, documents, and artifacts, and the various methods of analyzing and interpreting this information.

3. The third part of the paper discusses the various schools of thought in the study of history. It is pointed out that there are many different ways of looking at the past, and each school of thought has its own strengths and weaknesses. The author discusses the various schools of thought, such as the Annales School, the New History, and the Quantitative Revolution, and the various methods of research associated with each.

4. The fourth part of the paper discusses the various applications of the study of history. It is pointed out that the study of history is not only a means of satisfying a natural curiosity about the past, but also a means of developing a sense of responsibility for the future. The author discusses the various applications of the study of history, such as the study of the history of the United States, the study of the history of the world, and the study of the history of the human mind.

5. The fifth part of the paper discusses the various conclusions of the study of history. It is pointed out that the study of history is a process of critical analysis and interpretation, and that the conclusions of the study of history are always subject to revision. The author discusses the various conclusions of the study of history, such as the importance of the study of history, the various methods of historical research, and the various schools of thought in the study of history.

5		6		7		8	
E	F	F	G	G	H	H	I
-1.87	-1.87	-1.64	-1.60	-1.75	-1.67	-1.79	-1.45
-1.25	-1.25	-0.94	-0.60	-0.54	-0.37	-0.41	-0.23
-2.34		-1.56		-1.27		-1.45	
1.88	1.88	1.29	1.96	1.62	1.87	1.85	2.04
-1.88	-1.29	-1.88	-1.62	-1.96	-1.85	-1.87	0.00
-1.14	-0.97	-0.99	-0.62	-0.60	-0.42	-0.37	-0.01
-1.58		-1.20		-0.77		-0.28	
-0.16	0.16	-0.40	0.32	-0.12	0.15	-0.18	0.18
0.12	0.40	-0.16	0.12	-0.32	0.18	-0.15	0.00
0.13	0.21	-0.06	0.02	-0.08	0.02	-0.03	0.00
0.25		-0.03		-0.04		-0.02	
-0.08	0.08	-0.06	0.06	-0.06	0.04	-0.02	0.02
1.64	2.12	0.83	2.34	1.38	2.06	1.65	2.24

Influence Lines - First Correction

Load at Panel Pt 3 (= D)

Panel 1

$$6.77A - .2B = 0$$

$$A = .03$$

$$-.52A + 5.02B = 4.71$$

$$R_1 = \frac{(3 - .0866).03 + (3 - .1732).94}{2(2 - .0866)} = .72$$

$$M_{AB} = 2(.03 + \frac{.94}{2} - .72) = -.44$$

$$M_{BA} = 2(.94 + \frac{.03}{2} - .72) = .46$$

Panel 2

$$5.34B - .62C = 4.30$$

$$B = .98$$

$$-.76B + 3.77C = 4.84$$

$$C = 1.48$$

$$R_2 = \frac{(3 - .0443).98 + (3 - .0886)1.48}{2(2 - .0443)} = 1.84$$

$$M_{BC} = 3(.98 + \frac{1.48}{2} - 1.84) = -.36$$

$$M_{CB} = 3(1.48 + \frac{.98}{2} - 1.84) = .39$$

Panel 3

$$4.05C - .9D = 4.11$$

$$C = .84$$

$$-1.02C + 2.53D = -2.84$$

$$D = -.78$$

$$R_3 = \frac{(3 - .0482).84 + (3 - .0964)(-.78)}{2(2 - .0482)} = .06$$

$$M_{CD} = 4(.84 - \frac{.78}{2} - .06) = 1.56$$

$$M_{DC} = 4(-.78 + \frac{.84}{2} - .06) = -1.68$$

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Panel 4

$$2.5D - 1E = 3.36$$

$$-1D + 2.5E = -2.81$$

$$D = 1.07$$

$$E = -.70$$

$$R = \frac{3}{4}(1.07 - .70) = .28$$

$$M_{DE} = 4(1.07 - \frac{.70}{2} - .28) = 1.76$$

$$M_{ED} = 4(-.70 + \frac{1.07}{2} - .28) = -1.80$$

Panel 5

$$2.5F - 1E = -2.84$$

$$-1F + 2.5E = -1.93$$

$$E = -1.46$$

$$F = -1.72$$

$$R = \frac{3}{4}(-1.46 - 1.72) = -2.38$$

$$M_{FE} = 4(-1.72 - \frac{1.46}{2} + 2.38) = -.28$$

$$M_{EF} = 4(-1.46 - \frac{1.72}{2} + 2.38) = .24$$

Panel 6

$$4.05G - 0.9F = -2.43$$

$$-1.02G + 2.53F = -2.81$$

$$G = -.93$$

$$F = -1.48$$

$$R = \frac{-(3 - .0482) \cdot .93 - (3 - .0964)1.48}{2(2 - .0482)} = -1.80$$

$$M_{FG} = 4(-1.48 - \frac{.93}{2} + 1.80) = -.56$$

$$M_{GF} = 4(-.93 - \frac{1.48}{2} + 1.80) = .52$$

1. The first part of the paper is devoted to a general discussion of the problem. It is shown that the problem is of great importance in the theory of differential equations.

2. In the second part, we consider the case of a linear differential equation. It is shown that the problem can be solved by the method of variation of constants.

3. In the third part, we consider the case of a nonlinear differential equation. It is shown that the problem can be solved by the method of perturbation.

4. In the fourth part, we consider the case of a system of differential equations. It is shown that the problem can be solved by the method of matrix.

Panel 7

$$5.34 \text{ H} - .62 \text{ G} = -2.78$$

$$-.76 \text{ H} + 3.77 \text{ G} = -2.94$$

$$\text{G} = -.91$$

$$\text{H} = -.63$$

$$\text{R} = - \frac{(3-.0443) \cdot .63 - (3-.0886) \cdot .91}{2(2-.0443)} = -1.15$$

$$\text{M}_{\text{GH}} = 3 \left(-.91 - \frac{.63}{2} + 1.15 \right) = -.21$$

$$\text{M}_{\text{HG}} = 3 \left(-.63 - \frac{.91}{2} + 1.15 \right) = .21$$

Panel 8

$$6.77 \text{ I} - .2 \text{ H} = 0$$

$$-.52 \text{ I} + 5.02 \text{ H} = -2.80$$

$$\text{H} = -.56$$

$$\text{I} = -.02$$

$$\text{R} = - \frac{(3-.0866) \cdot .02 - (3-.1732) \cdot .56}{2(2-.0866)} = -.43$$

$$\text{M}_{\text{HI}} = 2 \left(-.56 - \frac{.02}{2} + .43 \right) = -.28$$

$$\text{M}_{\text{IH}} = 2 \left(-.02 - \frac{.56}{2} + .43 \right) = .26$$

Influence Lines - Second Correction

Load @ PP3 = D

Panel 1

$$6.77 A - .2 B = 0$$

$$-.52 A + 5.02 B = +.44$$

$$A = .003$$

$$B = .090$$

$$R_1 = \frac{(3 - .0866) \cdot 0.003 + (3 - 1.732) \cdot 0.09}{2(2 - .0866)} = .094$$

$$M_{AB} = 2(.003 + \frac{.090}{2} - .094) = -.09$$

$$M_{BA} = 2(.090 + .003 - .094) = -.01$$

Panel 2

$$5.34 B - .62 C = -.46$$

$$-.76 B + 3.77 C = 1.56$$

$$B = -.04$$

$$C = .41$$

$$R_2 = \frac{(3 - .0443) \cdot -.04 + (3 - .0886)(+.41)}{2(2 - .0443)} = .28$$

$$M_{BC} = 3(-.04 + \frac{.41}{2} - .28) = -.36$$

$$M_{CB} = 3(+.41 - \frac{.04}{2} - .28) = .33$$

Panel 3

$$4.05 C - 0.9 D = -.39$$

$$-1.02 C + 2.53 D = -1.76$$

$$C = -.27$$

$$D = -.81$$

$$R_3 = \frac{(3 - .0482)(-.27) + (3 - .0964)(-.81)}{2(2 - .0482)} = -.80$$

$$M_{CD} = 4(-.27 - \frac{.81}{2} + .80) = .52$$

$$M_{DC} = 4(-.81 - \frac{.27}{2} + .80) = -.44$$

CHICAGO, ILL., MAY 1, 1919

TO THE EDITOR:

I have the honor to acknowledge the receipt of your letter of April 25, 1919, in relation to the matter of the American Medical Association's policy regarding the use of the word "disease" in the title of the new edition of the "Textbook of Medicine" published by the American Medical Association.

I am sorry that I cannot give you a more definite answer at this time, but the matter is being considered by the Committee on the Revision of the Textbook of Medicine, and I am sure that you will understand the necessity of waiting for their decision.

I am sure that you will understand the necessity of waiting for their decision, and I am sure that you will understand the necessity of waiting for their decision.

Very truly,
Yours,
W. H. W.

W. H. W.

I am sure that you will understand the necessity of waiting for their decision, and I am sure that you will understand the necessity of waiting for their decision.

Panel 4

$$2.5 D - 1E = 1.68$$

$$-1.0 D + 2.5 E = -.24$$

$$D = .75$$

$$E = .21$$

$$R_4 = \frac{3}{4} (.75 + .21) = .72$$

$$M_{DE} = 4(.75 + \frac{.21}{2} - .72) = .52$$

$$M_{ED} = 4(.21 + \frac{.75}{2} - .72) = -.56$$

Panel 5

$$-1 F + 2.5 E = 1.80$$

$$2.5 F + 1.0 E = 1.56$$

$$E = .96$$

$$F = .61$$

$$R_5 = \frac{3}{4} (.96 + .61) = 1.18$$

$$M_{EF} = 4(.96 + \frac{.61}{2} - 1.18) = .32$$

$$M_{FE} = 4(.61 + \frac{.96}{2} - 1.18) = -.40$$

Panel 6

$$-1.02 G + 2.53 F = .28$$

$$4.05 G - 0.9 F = .21$$

$$G = .08$$

$$F = .14$$

$$R_6 = \frac{(3-.0482).08 + (3-.0964).14}{2(2-.0482)} = .16$$

$$M_{FG} = 4(.14 + \frac{.08}{2} - .16) = .08$$

$$M_{GF} = 4(.08 + \frac{.14}{2} - .16) = -.04$$

Panel 7

$$-.76 H + 3.77 G = -.52$$

$$5.34 H - .62 G = .28$$

$$H = .04$$

$$G = -.13$$

$$R_7 = \frac{(3-.0443).04 - (3-.0886).13}{2(2-.0443)} = -.07$$

$$M_{GH} = 3(-.13 + \frac{.04}{2} + .07) = -.12$$

$$M_{HG} = 3(.04 - \frac{.13}{2} + .07) = .15$$

Panel 8

$$-.52 I + 5.02 H = -.21$$

$$6.77 I - 0.20 H = 0$$

$$I = 0$$

$$H = -.04$$

$$R_8 = -\frac{(3-.1732).04}{2(2-.0866)} = -.03$$

$$M_{HI} = 2(-.04 + .03) = -.02$$

$$M_{IH} = 2(-\frac{.04}{2} + .03) = .02$$

Load At PP3 = D

Panel Point	1		2		3		4	
	A	B	B	C	C	D	D	E
Q	3.81	4.49	4.16	4.36	4.02	4.12	-2.81	-2.81
q	.59	.96	.94	1.34	1.49	2.23	-1.87	-1.87
R	3.40		3.18		3.81		-3.51	
M'	-4.66	-4.30	-4.71	-4.11	-4.84	-3.36	2.84	2.84
-Q	0	4.71	4.30	4.84	4.11	-2.82	3.36	-2.81
q	.03	.94	.98	1.48	.84	-.78	1.07	-.70
R	.72		1.84		.06		.28	
M''	-.44	.46	-.36	.39	1.56	-1.68	1.76	-1.80
-Q	0	.44	-.46	1.56	-.39	-1.76	1.68	-.24
q	.003	.090	-.04	.41	-.27	-.81	.75	.21
R	.094		.28		-.80		.72	
M'''	-.09	-.01	-.36	.33	.52	-.44	.52	-.56
Σ M	-5.19	-3.85	-5.43	-3.39	-2.76	-5.48	5.12	.48

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Chapter XLII	420
Chapter XLIII	430
Chapter XLIV	440
Chapter XLV	450
Chapter XLVI	460
Chapter XLVII	470
Chapter XLVIII	480
Chapter XLIX	490
Chapter L	500
Chapter LI	510
Chapter LII	520
Chapter LIII	530
Chapter LIV	540
Chapter LV	550
Chapter LVI	560
Chapter LVII	570
Chapter LVIII	580
Chapter LIX	590
Chapter LX	600
Chapter LXI	610
Chapter LXII	620
Chapter LXIII	630
Chapter LXIV	640
Chapter LXV	650
Chapter LXVI	660
Chapter LXVII	670
Chapter LXVIII	680
Chapter LXIX	690
Chapter LXX	700
Chapter LXXI	710
Chapter LXXII	720
Chapter LXXIII	730
Chapter LXXIV	740
Chapter LXXV	750
Chapter LXXVI	760
Chapter LXXVII	770
Chapter LXXVIII	780
Chapter LXXIX	790
Chapter LXXX	800
Chapter LXXXI	810
Chapter LXXXII	820
Chapter LXXXIII	830
Chapter LXXXIV	840
Chapter LXXXV	850
Chapter LXXXVI	860
Chapter LXXXVII	870
Chapter LXXXVIII	880
Chapter LXXXIX	890
Chapter LXXXX	900
Chapter LXXXXI	910
Chapter LXXXXII	920
Chapter LXXXXIII	930
Chapter LXXXXIV	940
Chapter LXXXXV	950
Chapter LXXXXVI	960
Chapter LXXXXVII	970
Chapter LXXXXVIII	980
Chapter LXXXXIX	990
Chapter LXXXXX	1000

cont.)

[illegible]

Influence Lines - First Corrections
Load at E

Panels 1 & 8

$$6.77A - 0.20B = 0 \quad A = .02$$

$$-0.52A + 5.02B = 3.72 \quad B = .72$$

$$R_1 = \frac{2.914 \times .02 + 2.828 \times .72}{3.828} = .55$$

$$M_{AB} = 2\left(.02 + \frac{.72}{2} - .55\right) = -.34$$

$$M_{BA} = 2\left(.72 + \frac{.02}{2} - .55\right) = .36$$

Panels 2 & 7

$$5.34B - 0.63C = 3.60 \quad B = .81$$

$$-0.77B + 3.77C = 3.84 \quad C = 1.18$$

$$R_2 = \frac{2.96 \times .81 + 2.91 \times 1.18}{3.912} = 1.49$$

$$M_{BC} = 3\left(.81 + \frac{1.18}{2} - 1.49\right) = -.27$$

$$M_{CB} = 3\left(1.18 + \frac{.81}{2} - 1.49\right) = .27$$

Panels 3 & 6

$$4.06C - 0.89D = 3.24 \quad C = 1.23$$

$$-1.02C + 2.53D = 3.76 \quad D = 1.99$$

$$R_3 = \frac{2.95 \times 1.23 + 2.90 \times 1.99}{3.904} = 2.40$$

$$M_{CD} = 4\left(1.23 + \frac{1.99}{2} - 2.40\right) = -.72$$

$$M_{DC} = 4\left(1.99 + \frac{1.23}{2} - 2.40\right) = .80$$

Panels 4 & 5

$$2.5E - 1.0D = 2.68$$

$$-1.0E + 2.5D = -3.75$$

$$R_4 = \frac{3}{4}(-1.28 + .56) = -.54$$

$$M_{DE} = 4\left(-1.28 + \frac{.56}{2} + .54\right) = -1.84$$

$$M_{ED} = 4\left(.56 - \frac{1.28}{2} + .54\right) = 1.84$$

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Influence Lines - Second Correction

Load at E

Panels 1 & 8

$$6.77A - 0.20B = 0$$

$$A = 0$$

$$-0.52A + 5.02B = .27$$

$$B = .05$$

$$R_4 = .04$$

$$R_1 = \frac{2.914 \times 0 + 2.828 \times .05}{3.828}$$

$$M_{AB} = 2\left(0 + \frac{.05}{2} - .04\right) = -.04$$

$$M_{BA} = 2\left(.05 + \frac{0}{2} - .04\right) = .02$$

Panels 2 & 7

$$5.34B - 0.63C = -.36$$

$$B = -.05$$

$$-0.77B + 3.77C = .72$$

$$C = .18$$

$$R_2 = \frac{-2.96 \times .05 + 2.91 \times .18}{3.912}$$

$$R_4 = .10$$

$$M_{BC} = 3\left(-.05 + \frac{.18}{2} - .10\right) = -.18$$

$$M_{CB} = 3\left(.18 - \frac{.05}{2} - .10\right) = .18$$

Panels 3 & 6

$$4.06C - 0.89D = -.27$$

$$C = -.24$$

$$-1.02C + 2.53D = 1.84$$

$$D = -.86$$

$$R_3 = \frac{2.95(-.25) + 2.90(-.82)}{3.904}$$

$$R_3 = -.80$$

$$M_{CD} = 4\left(-.25 - \frac{.82}{2} + .80\right) = .56$$

$$M_{DC} = 4\left(-.82 - \frac{.25}{2} + .80\right) = -.56$$

Panels 4 & 5

$$2.5E - 1.0D = -.80$$

$$D = -.02$$

$$-1.0E + 2.5D = 1.84$$

$$E = .73$$

$$R_4 = \frac{3}{4}(-.02 + .73)$$

$$R_4 = .53$$

$$M_{DE} = 4\left(-.02 + \frac{.73}{2} + .53\right) = -.76$$

$$M_{ED} = 4\left(.73 - \frac{.02}{2} - .53\right) = .76$$

1. 5. 1.
2. 5. 2.
3. 5. 3.

1. 5. 1. - 1. 5. 1.
2. 5. 2. - 1. 5. 2.

1. 5. 1.
2. 5. 2.
3. 5. 3.

1. 5. 1.
2. 5. 2.
3. 5. 3.

1. 5. 1. - 1. 5. 1.
2. 5. 2. - 1. 5. 2.

Load at Panel Pt 4 = E

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	3.04	3.59	3.32	3.49	3.21	3.30	3.75	3.75
α	.47	.76	.75	1.08	1.19	1.78	2.50	2.50
R	2.79		2.53		3.04		4.69	
M'	-3.88	-3.60	-3.72	-3.24	-3.84	-2.68	-3.76	-3.76
-Q	0	3.72	3.60	3.84	3.24	3.76	2.68	-3.75
α	.02	.72	.81	1.18	1.23	1.99	-1.28	.56
R	.55		1.49		2.40		- .54	
M''	- .34	.36	- .27	.27	- .72	.80	1.84	-1.84
-Q	0	.27	- .36	.72	- .27	-1.84	- .80	1.84
α	0	.05	- .05	.18	- .25	- .82	- .02	.73
R	.04		.10		- .80		.53	
M''	- .04	.02	- .18	.18	.56	- .56	- .76	.76
M'''	-4.26	-3.32	-4.17	-2.79	-4.00	-2.44	-2.68	-4.84

Panel	5		6		7		8	
Joint	E	F	F	G	G	H	H	I
-Q	-3.75	-3.75	-3.29	-3.20	-3.50	-3.33	-3.58	-2.91
α	-2.50	-2.50	-1.87	-1.20	-1.08	-0.75	-0.83	-0.45
R	-4.69		-3.12		-2.53		-2.91	
M	3.75	3.75	2.58	3.92	3.24	3.73	3.60	4.08
-Q	3.76	-2.58	-3.75	-3.24	-3.92	-3.60	-3.72	0
α	1.30	- .51	-1.98	-1.23	-1.20	- .81	- .72	- .02
R	.59		-2.40		-1.51		- .55	
M'	1.84	1.80	- .76	.72	- .27	.30	- .36	.34
-Q	-1.84	.76	1.80	.27	- .72	.36	- .30	0
α	- .73	.02	.82	.25	- .18	.05	- .05	0
R	- .53		.80		- .10		- .04	
M''	- .76	.76	.56	- .56	- .18	.18	- .02	.04
M'''	4.83	2.71	2.38	4.08	2.79	4.18	3.22	4.26

Preliminary Moment Computations - Web Members

Member AA'

Moment Dh	=	3144	fk
hh E-60	=	2865	
Impact	=	<u>615</u>	
Total		3480	
hh H-15-S-12 44	=	368	
Conc	=	86	
Impact	=	<u>50</u>	
Total		504	
Sidewalk hh	=	220	
Design Moment	=	7362	fk

Member BB'

Dh	=	5170	
hh E-60	=	4410	
Impact	=	<u>950</u>	
Total		5360	
hh H15-S-12 44	=	605	
Conc.	=	125	
Impact	=	<u>83</u>	
Total		813	
Sidewalk hh	=	362	
Design Moment	=	11,745	fk

Member CC'

Dh	=	3000	
hh E-60	=	2630	
Impact	=	<u>830</u>	
Total		3460	
hh H15-S-12-44	=	350	
Conc.	=	92	
Impact	=	<u>67</u>	
Total		509	
Sidewalk hh	=	256	
Design Moment	=	7243	fk

Member DD'

DL = 1600

LL E-60 = 1480

Impact = 520

Total 2000

LL H15-S12-44 = 182

Conc. = 69

Impact = 37

Total 288

Sidewalk = 144

Design Moment = 4046 fk

Member EE'

DL = 945

LL E-60 = 910

Impact = 441

Total 1351

LL H15-S12-44 = 110

Conc. = 52

Impact = 26

Total 188

Sidewalk = 97

Design Moment = 2593 fk

Preliminary Moment Computations - Chord Members

Member AB

$$DL = 3440$$

$$LL \text{ E-60} = 3020$$

$$\text{Impact} = \underline{695}$$

$$\text{Total} = 3715$$

$$LL \text{ H15-S12-44} = 403$$

$$\text{Conc.} = 87$$

$$\text{Impact} = \underline{73}$$

$$\text{Total} = 563$$

$$\text{Sidewalk hh} = 240$$

$$\text{Design Moment} = 7958 \text{ fk}$$

Member BC

$$DL = 2260$$

$$LL \text{ E-60} = 2040$$

$$\text{Impact} = \underline{520}$$

$$\text{Total} = 2560$$

$$LL \text{ H15-S12-44} = 264$$

$$\text{Conc.} = 50$$

$$\text{Impact} = \underline{52}$$

$$\text{Total} = 366$$

$$\text{Sidewalk hh} = 173$$

$$\text{Design Moment} = 5360 \text{ fk}$$

Member CD

DL = 1432

LL E-60 = 1330

Impact = 383

Total 1713

LL H15-S12-44 = 168

Conc. = 73

Impact = 44

Total 285

Sidewalk = 118

Design Moment = 3548 fk

Member DE

DL = 1480

LL E-60 = 1200

Impact = 490

Total 1890

LL H15-S12-44 = 173

Conc. = 66

Impact = 49

Total 288

Sidewalk = 133

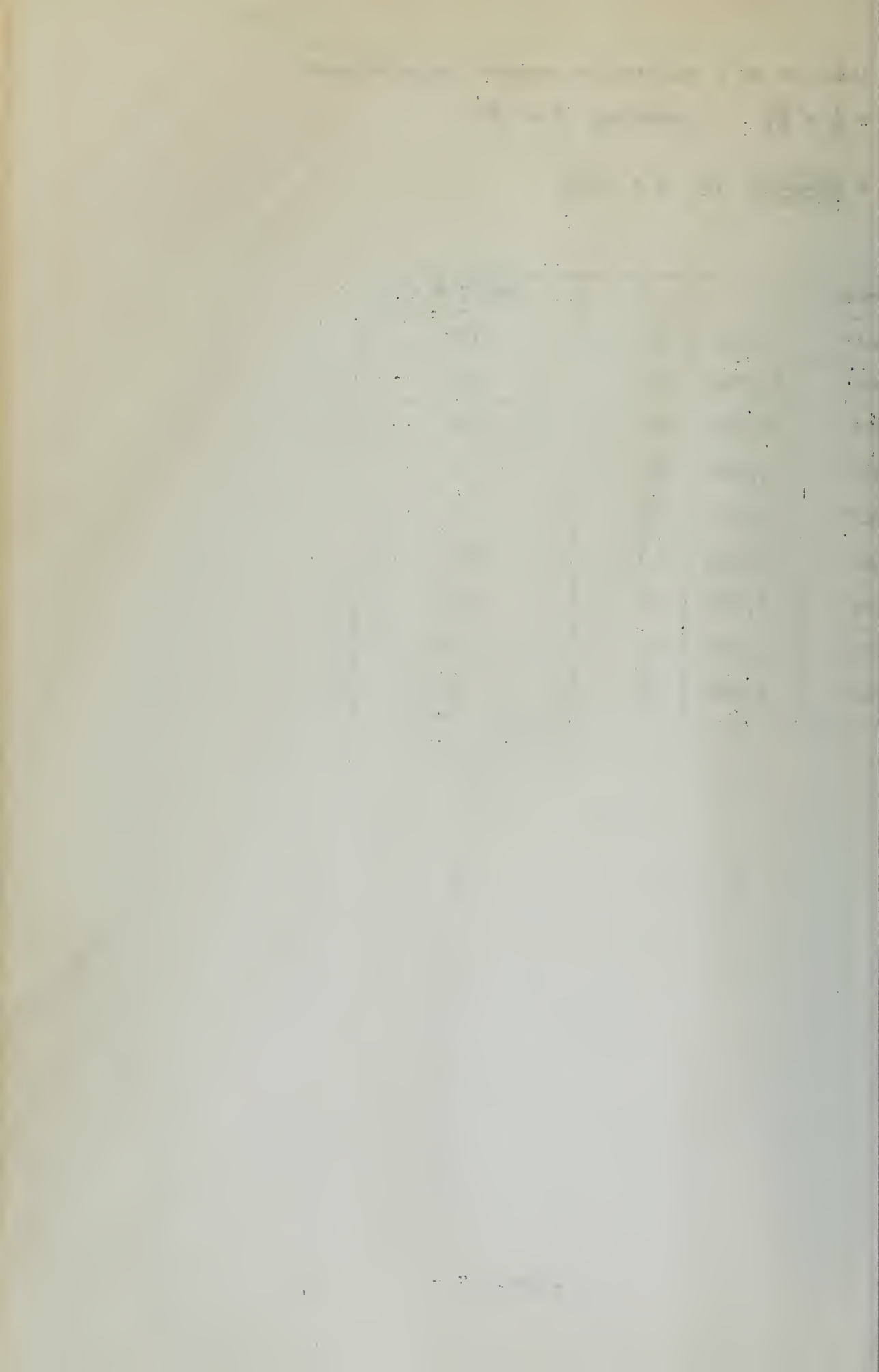
Design Moment = 3790 fk

Determination of K values for second computations

$K = \frac{I}{L} = \frac{Mc}{fL}$ Assuming $C = 15''$

$K = \frac{N \times 15 \times 12}{20 \times L \times 12}$ or $K = .75 \frac{M}{L}$

Member	M	L	.75M/L = K
AA'	7362	35	160
BB'	11,745	38	232
CC'	7,243	40	136
DD'	4,064	41	74
EE'	2,593	41	47
AB	7,958	30	200
BC	5,360	30	134
CD	3,548	30	90
DE	3,790	30	95



Influence Line Computations - Second Set
Load at B

Panel 1

$$\begin{aligned} -Q_A &= \frac{(.0942 \times 160 - 200)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)200} = 0.1 \\ -Q_B &= \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28 \\ Q_{R1} &= \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)200} = 0.31 \end{aligned}$$

Panel 2

$$\begin{aligned} -Q_B &= \frac{(.0463 \times 232 - 134)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)134} = -1.11 \\ -Q_C &= \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21 \\ Q_{R2} &= \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)134} = -.009 \end{aligned}$$

Panel 3

$$\begin{aligned} -Q_C &= \frac{(.0507 \times 136 - 90)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)90} = -1.10 \\ -Q_D &= \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19 \\ Q_{R3} &= \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)90} = -0.13 \end{aligned}$$

Panel 4

$$\begin{aligned} -Q_D &= \frac{-95(.125 \times 30)}{4 \times 95} = -.94 \\ -Q_E &= \frac{(-.125 \times 30)}{4} = -.94 \\ Q_{R4} &= \frac{(-.125 \times 30)}{4 \times 95} = -.01 \end{aligned}$$

Panel 5

$$-Q_E = \frac{-1.25 \times 30}{4} = -.94$$

$$-Q_F = \frac{-1.25 \times 30}{4} = -.94$$

$$Q_{E5} = \frac{-1.25 \times 30}{4 \times 95} = -.0099$$

Panel 6

$$-Q_G = \frac{(.0507 \times 136 - 90)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)90} = -.76$$

$$-Q_F = \frac{(-1.25 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -.82$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)90} = -.0091$$

Panel 7

$$-Q_H = \frac{(.0463 \times 134 - 134)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)134} = -.81$$

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -.87$$

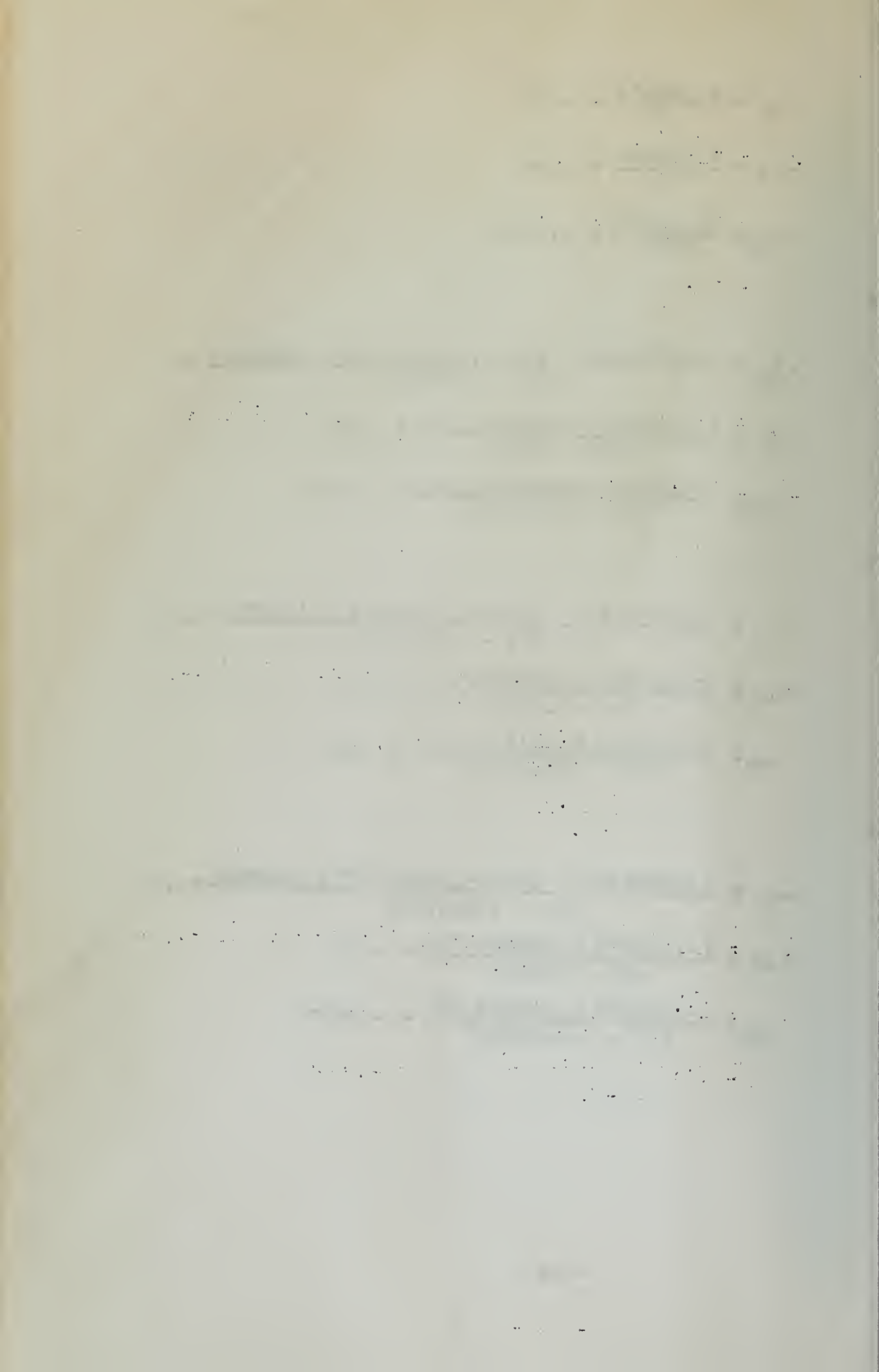
$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)134} = -.065$$

Panel 8

$$-Q_I = \frac{(.0942 \times 160 - 200)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)200} = -.83$$

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -.90$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)200} = -.0045$$



Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)200} = 4.98$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)200} = 0.27$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)134} = 4.82$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.24$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)134} = 0.39$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)90} = -2.20$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.39$$

$$Q_{R3} = \frac{-.25 \times 30 - .0482 \times 37.5}{2(2 - .0482)90} = -.027$$

Panel 4

$$-Q_D = \frac{(-95)(.25 \times 30)}{4 \times 95} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30)}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4 \times 95} = -.020$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. In the second part, we shall consider the case of a single particle.

3. The third part is devoted to the case of a system of particles.

4. In the fourth part, we shall discuss the results of our calculations.

5. The fifth part is devoted to a comparison of our results with the results of other authors.

6. In the sixth part, we shall discuss the physical meaning of our results.

7. The seventh part is devoted to a summary of the results of our work.

8. In the eighth part, we shall discuss the conclusions of our work.

9. The ninth part is devoted to a discussion of the prospects of our work.

10. In the tenth part, we shall discuss the results of our calculations.

11. The eleventh part is devoted to a comparison of our results with the results of other authors.

12. In the twelfth part, we shall discuss the physical meaning of our results.

13. The thirteenth part is devoted to a summary of the results of our work.

14. In the fourteenth part, we shall discuss the conclusions of our work.

15. The fifteenth part is devoted to a discussion of the prospects of our work.

Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -.020$$

Panel 6

$$-Q_F = -1.64$$

$$-Q_G = -1.52$$

$$Q_{R6} = -.018$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.62$$

$$Q_{R7} = -.013$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.66$$

$$Q_{R8} = -.0090$$

Load at D

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)200} = 4.15$$

$$-Q_B = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)200} = .022$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)134} = 4.02$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)134} = .033$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)90} = 3.80$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)90} = .046$$

Panel 4

$$-Q_D = \frac{(-.95)(.375 \times 30)}{4 \times 95} = -2.81$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.81$$

$$Q_{R4} = \frac{(-.375 \times 30)}{4 \times .95} = .030$$

1870

1871

1872

1873

1874

1875

1876

1877

1878

1879

1880

1881

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R5} = -.030$$

Panel 6

$$-Q_F = -2.46$$

$$-Q_G = -2.28$$

$$Q_{R6} = -0.27$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.43$$

$$Q_{R7} = -.020$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.49$$

$$Q_{R8} = -.014$$

1890
1891
1892

1893
1894
1895

1896
1897
1898

1899
1900
1901

Load at E

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)200} = 3.32$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)} = 3.59$$

$$Q_{R1} = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)200} = .018$$

Panel 2

$$-Q_B = \frac{(.0463 \times 132 - 134)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)134} = 3.22$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R2} = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)134} = .026$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)90} = 3.04$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

$$Q_{R3} = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)90} = .037$$

Panel 4

$$-Q_D = \frac{(-95)(-.5 \times 30)}{4 \times 95} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R4} = \frac{.5 \times 30}{4 \times 95} = .040$$

My dear Mr. Brewster,

I have just received your letter of the 17th inst.

and am glad to hear from you.

I am sorry that I cannot give you more information at present.

I am sure that you will understand my position.

I am very truly yours,

Wm. Brewster

Secretary of the American Ornithologists Union

100 West 42nd Street, New York City

Very truly yours,

Wm. Brewster

Secretary of the American Ornithologists Union

Panel 5

$$-Q_E = -3.78$$

$$-Q_F = -3.78$$

$$Q_{R5} = -.040$$

Panel 6

$$-Q_E = -3.28$$

$$-Q_G = -3.04$$

$$Q_{R6} = -.036$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.24$$

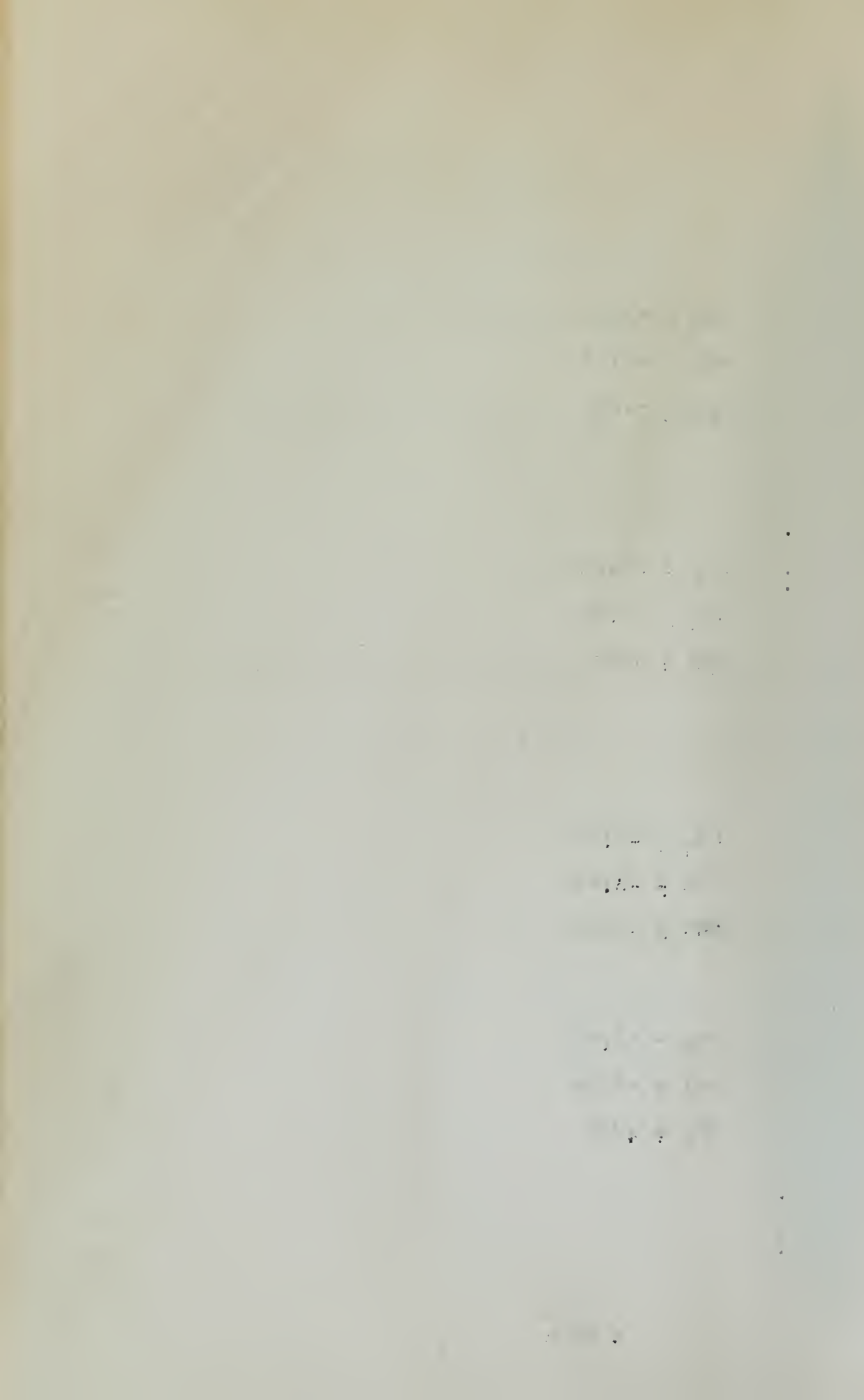
$$Q_{R7} = -.026$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.32$$

$$Q_{R8} = .018$$



Panel Constant Computations Load at B

Panel 1

$$\left[1.5 \times 160 + 200 + \frac{(3 - .0866)(.0942 \times 160 - 200)}{2(2 - .0866)} \right] A + \left[\frac{200}{2} + \frac{(3 - .1734)(.0942 \times 160 - 200)}{2(2 - .0866)} \right] B = 5.82$$

$$299A - 37B = 5.82$$

$$\left[200 + 1.5 \times 232 - \frac{(3 - .1732)200}{2(2 - .0866)} \right] B + \left[\frac{200}{2} - \frac{(3 - .0866)200}{2(2 - .0866)} \right] A = 6.28$$

$$400B - 52A = 6.28$$

Solving Simultaneously: $A = .022$ $B = .019$

$$R_1 = \frac{(3 - .0866)(.022) + (3 - .1732)(.019)}{2(2 - .0866)} + .031 = .062$$

Panel 2

$$\left[1.5 \times 232 + 134 + \frac{(3 - .0443)(.0463 \times 232 - 134)}{2(2 - .0443)} \right] B + \left[\frac{134}{2} + \frac{(3 - .0886)(.0463 \times 232 - 134)}{2(2 - .0443)} \right] C = -1.11$$

$$\left[134 + 1.5 \times 136 - \frac{(3 - .0886)134}{2(2 - .0443)} \right] C + \left[\frac{134}{2} - \frac{(3 - .0443)134}{2(2 - .0443)} \right] B = -1.21$$

$$238C - 34B = -1.21$$

Solving Simultaneously: $B = -.003$ $C = -.005$

$$R_2 = \frac{(3 - .0443)(-.003) + (3 - .0886)(-.005)}{2(2 - .0443)} - .009 = -.015$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

where

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

and

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$S_{11} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Panel 3

$$.5x136 + 90 + \frac{(3-.0482)(.0507x136-90)}{2(2-.0482)} \Big] C \Big[\frac{90 + (3-.0964)(.0507x136-90)}{2} \frac{1}{2(2-.0482)} \Big]$$

$$D = -1.10$$

$$231C - 17D = 1.10$$

$$0 + 1.5x74 - \frac{(3-.0964)90}{2(2-.0482)} \Big] D + \frac{90 - (3-.0482)90}{2} \Big] C = -1.19$$

$$134D - 23C = -1.19$$

Solving Simultaneously: $C = -.0055; D = -.0098$

$$R_3 = \frac{(3-.0482)(-.0055) + (3-.0964)(-.0098)}{2(2-.0482)} - .013 = -.024$$

Panel 4

$$.5x74 + 95 + \frac{(3)(0-95)}{4} \Big] D + \frac{95 + (3)(0-95)}{2} \Big] E = -.94$$

$$135D - 24E = -.94$$

$$+ 1.5x47 - \frac{(3)95}{4} \Big] E + \frac{95 - (3)95}{2} \Big] D = -.94$$

$$94E - 24D = -.94$$

Solving Simultaneously $D = -.0092; E = -.012$

$$R_4 = \frac{3(-.0092) + 3(-.012)}{4} - .01 = -.026$$

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 1, 1801.

2. The second part is a report from the Secretary of the Treasury, dated January 1, 1801, on the state of the Treasury.

3. The third part is a report from the Secretary of the Navy, dated January 1, 1801, on the state of the Navy.

4. The fourth part is a report from the Secretary of the War, dated January 1, 1801, on the state of the War.

5. The fifth part is a report from the Secretary of the Interior, dated January 1, 1801, on the state of the Interior.

6. The sixth part is a report from the Secretary of the State, dated January 1, 1801, on the state of the State.

7. The seventh part is a report from the Secretary of the War, dated January 1, 1801, on the state of the War.

8. The eighth part is a report from the Secretary of the Navy, dated January 1, 1801, on the state of the Navy.

Panel 5

$$135E - 24F = -.94$$

$$-24E + 94F = -.94$$

$$E = -.012$$

$$F = -.0092$$

$$R_5 = \frac{3}{4} (-.0092 - .012) - .0099 = -.026$$

Panel 6

$$134F - 23G = -.82$$

$$-17F + 231G = -.76$$

$$F = -.0068$$

$$G = -.0039$$

$$R_6 = \frac{-2.95 \times .0039 - 2.90 \times .0068}{3.90} - .0091 = -.0173$$

Panel 7

$$238G - 34H = -.87$$

$$-25G + 389H = -.81$$

$$G = -.0040$$

$$H = -.0023$$

$$R_7 = \frac{-2.96 \times .0023 - 2.91 \times .0040}{3.91} - .0065 = -.0112$$

Panel 8

$$400H - 52I = -.90$$

$$-37H + 299I = -.83$$

$$H = -.0027$$

$$I = -.0031$$

$$R_8 = \frac{-2.91 \times .0031 - 2.83 \times .0027}{3.83} - .0045 = -.0088$$

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Panel Constant Computations - Load at C

Panel 1

$$299A - 37B = 4.98$$

$$-52A + 400B = 5.38$$

$$A = .019, B = .016$$

$$R_1 = \frac{2.91(.019) + 2.83(.016)}{2(1.91)} + .027 = .053$$

Panel 2

$$389B - 25C = 4.82$$

$$-34B + 238C = 5.24$$

$$B = .014, C = .024$$

$$R_2 = \frac{2.96(.014) + (2.91)(.024)}{3.92} + .039 = .067$$

Panel 3

$$231C - 17D = -2.20$$

$$-23C + 134D = -2.39$$

$$C = -.011, D = -.020$$

$$R_3 = \frac{2.95(-.011) + 2.90(-.020)}{3.90} + (-.027) = -.050$$

Panel 4

$$135D - 24E = -1.87$$

$$-24D + 94E = -1.87$$

$$D = -.018, E = -.025$$

$$R_4 = \frac{3(-.018) + 3(-.025)}{4} + (-.020) = -.052$$

[illegible text]

[illegible text]

[illegible text]

[illegible text]

[illegible text]

[illegible text]

[illegible text]

[illegible text]

Panel 5

$$E = -.024$$

$$F = -.018$$

$$R_5 = -.052$$

Panel 6

$$F = -.014$$

$$G = -.0078$$

$$R_6 = -.034$$

Panel 7

$$G = -.0080$$

$$H = -.0046$$

$$R_7 = -.022$$

Panel 8

$$H = -.0054$$

$$I = -.0062$$

$$R_8 = -.018$$

Panel Constant Computations - Load at PP3

Panel 1

$$299A - 37B = 4.15$$

$$-52A + 400B = 4.49$$

Solving Simultaneously; $A = .016$, $B = .013$

$$R_1 = \frac{2.91(.016) + 2.83(.013)}{3.82} + .022 = .044$$

Panel 2

$$389B - 25C = 4.02$$

$$-34B + 238C = 4.36$$

Solving Simultaneously; $B = .012$, $C = .020$

$$R_2 = \frac{2.96(.012) + 2.91(.020)}{3.92} + .033 = .057$$

Panel 3

$$231C - 17D = 3.80$$

$$-23C + 134D = 4.12$$

Solving Simultaneously; $C = .019$, $D = .034$

$$R_3 = \frac{2.95(.019) + 2.90(.034)}{3.90} + .046 = .086$$

Panel 4

$$135D - 24E = -2.81$$

$$-24D + 94E = -2.81$$

Solving Simultaneously; $D = -.027$, $E = -.037$

$$R_4 = \frac{3(-.027) + 3(-.037)}{4} + (-.03) = -.078$$

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Panel 5

$$E = -.036$$

$$F = -.028$$

$$R_5 = -.078$$

Panel 6

$$F = +.020$$

$$G = -.012$$

$$R_6 = -.051$$

Panel 7

$$G = -.012$$

$$H = -.0069$$

$$R_7 = -.033$$

Panel 8

$$H = -.0081$$

$$I = -.0093$$

$$R_8 = -.026$$

Panel Constant Computations - Load at E

Panel 1

$$299A - 37B = 3.32$$

$$-52A + 400B = 3.59$$

$$A = .012, B = .011$$

$$R_1 = \frac{2.91(.012) + 2.83(.011)}{3.82} + .018 = .035$$

Panel 2

$$389B - 25C = 3.22$$

$$-34B + 238C = 3.49$$

$$B = .009, C = .016$$

$$R_2 = \frac{2.96(.009) + 2.91(.016)}{3.92} + .026 = .045$$

Panel 3

$$231C - 17D = 3.04$$

$$-23C + 134D = 3.30$$

$$C = .015, D = .027$$

$$R_3 = \frac{2.95(.015) + 2.90(.027)}{3.90} + .037 = .069$$

Panel 4

$$135D - 24E = 3.75$$

$$-24D + 94E = 3.75$$

$$D = .036, E = .049$$

$$R_4 = \frac{3(.036) + 3(.049)}{4} + .040 = .10$$

Panel 5

$$E = -.048$$

$$F = -.037$$

$$R_5 = -.104$$

Panel 6

$$F = -.027$$

$$G = -.016$$

$$R_6 = -.068$$

Panel 7

$$G = -.016$$

$$H = -.0092$$

$$R_7 = -.044$$

Panel 8

$$H = -.011$$

$$I = -.012$$

$$R_8 = -.035$$

Moment Determination

Load at PPl

$$M = K(A + \frac{B}{2} - R) \quad FM_{AB}$$

Panel 1

$$M_{AB} = 200(.022 + \frac{.019}{2} - .062) \quad M_{AB} = -6.0$$

$$M_{BA} = 200(.019 + \frac{.022}{2} - .062) \quad M_{BA} = -6.4$$

Panel 2

$$M_{BC} = 134(-.003 - \frac{.005}{2} + .015) \quad M_{BC} = +1.21$$

$$M_{CB} = 134(-.005 - \frac{.003}{2} + .015) \quad M_{CB} = +1.07$$

Panel 3

$$M_{CD} = 90(-.0055 - \frac{.0098}{2} + .024) \quad M_{CD} = +1.26$$

$$M_{DC} = 90(-.0098 - \frac{.0055}{2} + .024) \quad M_{DC} = +0.99$$

Panel 4

$$M_{DE} = 95(-.0092 - \frac{.012}{2} + .026) \quad M_{DE} = +1.05$$

$$M_{ED} = 95(-.012 - \frac{.0092}{2} + .026) \quad M_{ED} = +.86$$

Panel 5

$$M_{EF} = 2.58$$

$$M_{FE} = 2.97$$

Panel 6

$$M_{FG} = 2.16$$

$$M_{GF} = 2.70$$

Panel 7

$$M_{GH} = 2.40$$

$$M_{HG} = 2.82$$

Panel 8

$$M_{HI} = 2.76$$

$$M_{IH} = 2.58$$

Load at PP2

Panel 1

$$M_{AB} = 200\left(.019 + \frac{.016}{2} - .053\right) \quad M_{AB} = -5.20$$

$$M_{BA} = 200\left(.016 + \frac{.019}{2} - .053\right) \quad M_{BA} = -5.40$$

Panel 2

$$M_{BC} = 134\left(.014 + \frac{.024}{2} - .067\right) \quad M_{BC} = -5.49$$

$$M_{CB} = 134\left(.024 + \frac{.014}{2} - .067\right) \quad M_{CB} = -4.82$$

Panel 3

$$M_{CD} = 90\left(-.011 - \frac{.020}{2} + .050\right) \quad M_{CD} = +2.61$$

$$M_{DC} = 90\left(-.020 - \frac{.011}{2} + .050\right) \quad M_{DC} = +2.16$$

Panel 4

$$M_{DE} = 95\left(-.018 - \frac{.025}{2} + .052\right) \quad M_{DE} = +2.09$$

$$M_{ED} = 95\left(-.025 - \frac{.018}{2} + .052\right) \quad M_{ED} = +1.71$$

Panel 5

$$M_{EF} = 3.44$$

$$M_{FE} = 3.96$$

Panel 6

$$M_{FG} = 2.88$$

$$M_{GF} = 3.60$$

Panel 7

$$M_{GH} = 3.20$$

$$M_{HG} = 3.76$$

Panel 8

$$M_{HI} = 3.68$$

$$M_{IH} = 3.44$$

Load at PF3

Panel 1

$$M_{AB} = 200\left(.016 + \frac{.013}{2} - .044\right) \quad M_{AB} = -4.40$$

$$M_{BA} = 200\left(.013 + \frac{.016}{2} - .044\right) \quad M_{BA} = -4.60$$

Panel 2

$$M_{BC} = 134\left(.012 + \frac{.020}{2} - .057\right) \quad M_{BC} = -4.69$$

$$M_{CB} = 134\left(.020 + \frac{.012}{2} - .057\right) \quad M_{CB} = -4.15$$

Panel 3

$$M_{CD} = 90\left(.019 + \frac{.034}{2} - .086\right) \quad M_{CD} = -4.50$$

$$M_{DC} = 90\left(.034 + \frac{.019}{2} - .086\right) \quad M_{DC} = -3.78$$

Panel 4

$$M_{DE} = 95\left(-.027 - \frac{.037}{2} + .078\right) \quad M_{DE} = 3.14$$

$$M_{ED} = 95\left(-.037 - \frac{.027}{2} + .078\right) \quad M_{ED} = 2.56$$

Panel 5

$$M_{EF} = 95\left(-.012 - \frac{.0092}{2} + .026\right) \quad M_{EF} = .86$$

$$M_{FE} = 95\left(-.0092 - \frac{.012}{2} + .026\right) \quad M_{FE} = .99$$

Panel 6

$$M_{FG} = 90\left(-.0068 - \frac{.0039}{2} + .017\right) \quad M_{FG} = .72$$

$$M_{GF} = 90\left(-.0039 - \frac{.0068}{2} + .017\right) \quad M_{GF} = .90$$

Panel 7

$$M_{GH} = 134\left(-.0040 - \frac{.0023}{2} + .011\right) \quad M_{GH} = .80$$

$$M_{HG} = 134\left(-.0023 - \frac{.0040}{2} + .011\right) \quad M_{HG} = .94$$

Panel 8

$$M_{HI} = 200\left(-.0027 - \frac{.0031}{2} + .0088\right) \quad M_{HI} = .92$$

$$M_{IH} = 200\left(-.0031 - \frac{.0027}{2} + .0088\right) \quad M_{IH} = .86$$

Load at PF4

Panel 1

$$M_{AB} = 200\left(.012 + \frac{.011}{2} - .035\right)$$

$$M_{AB} = -3.40$$

$$M_{BA} = 200\left(.011 + \frac{.012}{2} - .035\right)$$

$$M_{BA} = -3.60$$

Panel 2

$$M_{BC} = 134\left(.009 + \frac{.016}{2} - .045\right)$$

$$M_{BC} = -3.75$$

$$M_{CB} = 134\left(.016 + \frac{.009}{2} - .045\right)$$

$$M_{CB} = -3.35$$

Panel 3

$$M_{CD} = 90\left(.015 + \frac{.027}{2} - .069\right)$$

$$M_{CD} = -3.69$$

$$M_{DC} = 90\left(.027 + \frac{.015}{2} - .069\right)$$

$$M_{DC} = -3.15$$

Panel 4

$$M_{DE} = 95\left(.036 + \frac{.049}{2} - 0.10\right)$$

$$M_{DE} = -3.80$$

$$M_{ED} = 95\left(.049 + \frac{.036}{2} - 0.10\right)$$

$$M_{ED} = -3.13$$

Panel 5

$$M_{EF} = 1.72$$

$$M_{FE} = 1.98$$

Panel 6

$$M_{FG} = 1.44$$

$$M_{GF} = 1.80$$

Panel 7

$$M_{GH} = 1.60$$

$$M_{HG} = 1.88$$

Panel 8

$$M_{HI} = 1.84$$

$$M_{IH} = 1.72$$

First Moment Corrections - Load at B

1 -

$$299A - 37B = 0$$

$$-52A + 400B = -1.21$$

$$A = -.00038$$

$$B = -.0031$$

$$R_1 = \frac{-2.91 \times .00038 - 2.83 \times .0031}{3.83} = -.0026$$

$$M_{AB} = 200(-.00038 - \frac{1}{2} \times .0031 + .0026) = 0.14$$

$$M_{BA} = 200(-.0031 - \frac{1}{2} \times .00038 + .0026) = -0.14$$

2 -

$$388B - 25C = 6.4$$

$$-34B + 238C = -1.26$$

$$B = .016$$

$$C = -.0030$$

$$R_2 = \frac{2.96 \times .016 - 2.91 \times .003}{3.91} = .0099$$

$$M_{BC} = 134(.016 - \frac{1}{2} \times .0030 - .0099) = 0.62$$

$$M_{CB} = 134(-.0030 + \frac{1}{2} \times .016 - .0099) = -0.66$$

3

$$271C - 17D = -1.07$$

$$-23C + 134D = -1.05$$

$$C = -.0055$$

$$D = -.0088$$

$$R_3 = \frac{-2.95 \times .0055 - 2.90 \times .0088}{3.90} = -.011$$

$$M_{CD} = 90(-.0055 - \frac{1}{2} \times .0088 + .011) = 0.072$$

$$M_{DC} = 90(-.0088 - \frac{1}{2} \times .0055 + .011) = -0.072$$

4 -

$$94D - 24E = -.99$$

$$-24D + 135E = -.86$$

$$D = -.013$$

$$E = -.0086$$

$$R_4 = \frac{3}{4}(-.013 - .0086) = -.016$$

$$M_{DE} = 95(-.013 - \frac{1}{2}x.0086 + .016) = -.10$$

$$M_{ED} = 95(-.0086 - \frac{1}{2}x.013 + .016) = +.10$$

5 -

$$135E - 24F = -.86$$

$$-24E + 94F = -.72$$

$$E = -.0080$$

$$F = -.0097$$

$$R_5 = \frac{3}{4}(-.0080 - .0097) = -.013$$

$$M_{EF} = 95(-.0080 - \frac{1}{2}x.0097 + .013) = .05$$

$$M_{FE} = 95(-.0097 - \frac{1}{2}x.0080 + .013) = -.04$$

6 -

$$134F - 23G = -.99$$

$$-17F + 231G = -.80$$

$$F = -.0079$$

$$G = -.0040$$

$$R_6 = \frac{-2.90x.0079 - 2.95x.0040}{3.90} = -.0090$$

$$M_{FG} = 90(-.0079 - \frac{1}{2}x.0040 + .0090) = -.08$$

$$M_{GF} = 90(-.0040 - \frac{1}{2}x.0079 + .0090) = .09$$

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7 -

$$238G - 34H = -.90$$

$$-25G + 388H = -.92$$

$$G = -.0040$$

$$H = -.0026$$

$$R_7 = \frac{-2.91 \times .0040 - 2.96 \times .0026}{3.91} = -.0049$$

$$M_{GH} = 134(-.0040 - \frac{1}{2} \times .0026 + .0049) = -.05$$

$$M_{HG} = 134(-.0026 - \frac{1}{2} \times .0040 + .0049) = .04$$

8 -

$$400H - 52I = -.94$$

$$-37H + 299I = 0.00$$

$$H = -.0024$$

$$I = -.0003$$

$$R_8 = \frac{-2.83 \times .0024 - 2.91 \times .0003}{3.83} = -.0020$$

$$M_{HI} = 200(-.0024 - \frac{1}{2} \times .0003 + .0020) = -0.10$$

$$M_{IH} = 200(-.0003 - \frac{1}{2} \times .0024 + .0020) = 0.10$$

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Load at B

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
-Q	5.82	6.28	-1.11	-1.21	-1.10	-1.19	-.94	-.94
α	.022	.019	-.003	-.005	-.0055	-.0098	-.0092	-.012
R	.062		-.015		-.024		-.026	
M'	-6.0	-6.4	1.21	1.07	1.26	0.99	1.05	0.86
-Q	0.00	-1.21	6.4	-1.26	-1.07	-1.05	-0.99	-0.86
α	-.0004	.0031	0.16	-.0030	-.0055	-.0088	-.013	-.0086
R	-.0026		-.0099		-.011		-.016	
M''	0.14	-0.14	0.62	-0.66	0.07	-0.07	-.10	.10
-Q								
α								
R								
M'''								
M	-5.86	-6.54	1.83	0.41	1.33	0.92	0.95	0.96

5		6		7		8	
E	F	F	G	G	H	H	I
-0.94	-0.94	-0.82	-0.76	-0.87	-0.81	-0.90	-0.83
-0.12	-.0092	-.0068	-.0039	-.0040	-.0023	-.0027	-.0031
-.026		-.017		-.011		-.0088	
0.86	0.99	0.72	0.90	0.80	0.94	0.92	0.86
-0.86	-0.72	-0.99	-0.80	-0.90	-0.92	-0.94	0.00
-.0080	-.0097	-.0079	-.0040	-.0040	-.0026	-.0024	-.0003
-.013		-.0090		-.0049		-.0020	
.05	-.04	-.08	.09	-.05	.04	-.10	.10
0.91	0.95	0.64	0.99	0.75	0.98	0.82	0.96

First Moment Corrections - Load at C

$$1. \quad \begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= 5.49' \end{aligned}$$

$$\begin{aligned} A &= .0017 \\ B &= .014 \\ R_1 &= \frac{2.91 \times .0017 + 2.83 \times .014}{3.83} = .012 \end{aligned}$$

$$\begin{aligned} M_{AB} &= 200(.0017 + \frac{1}{2} \times .014 - .012) = -.60 \\ M_{BA} &= 200(.014 + \frac{1}{2} \times .0017 - .012) = .60 \end{aligned}$$

$$2. \quad \begin{aligned} 388B - 25C &= 5.40 \\ -34B + 238C &= -2.61 \end{aligned}$$

$$\begin{aligned} B &= .013 \\ C &= -.0091 \\ R_2 &= \frac{2.96 \times .013 - 2.91 \times .0091}{3.91} = .0031 \end{aligned}$$

$$\begin{aligned} M_{BC} &= 134(.013 - \frac{1}{2} \times .0091 - .0031) = .67 \\ M_{CB} &= 134(-.0091 + \frac{1}{2} \times .013 - .0031) = -.71 \end{aligned}$$

$$3. \quad \begin{aligned} 231C - 17D &= 4.82 \\ -23C + 134D &= -2.09 \end{aligned}$$

$$\begin{aligned} C &= .020 \\ D &= .012 \\ R_3 &= \frac{2.95 \times .02 - 2.90 \times .012}{3.90} = .0062 \end{aligned}$$

$$\begin{aligned} M_{CD} &= 90(.020 - \frac{1}{2} \times .012 - .0062) = .72 \\ M_{DC} &= 90(-.012 + \frac{1}{2} \times .020 - .0062) = -.72 \end{aligned}$$

$$4. \quad \begin{aligned} 94D - 24E &= -2.16 \\ -24D + 135E &= -1.72 \end{aligned}$$

$$\begin{aligned} D &= -.028 \\ E &= .018 \end{aligned}$$

$$\begin{aligned} R_4 &= \frac{3}{4} (-.028 - .018) = -.035 \\ M_{DE} &= 95(-.028 - \frac{1}{2} \times .018 + .035) = -.23 \\ M_{ED} &= 95(-.018 - \frac{1}{2} \times .028 + .035) = .23 \end{aligned}$$

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5.

$$\begin{aligned}
 135E - 24F &= -1.71 \\
 -24E + 94F &= -1.44 \\
 E &= -.016 \\
 F &= -.019
 \end{aligned}$$

$$R_5 = \frac{3}{4} (-.016 - .019) = -.026$$

$$M_{EF} = 95(-.016 - \frac{1}{2} \times .019 + .026) = .10$$

$$M_{FE} = 95(-.016 - \frac{1}{2} \times .019 + .026) = -.10$$

6.

$$\begin{aligned}
 134F - 23G &= -1.98 \\
 -17F + 231G &= -1.60 \\
 F &= -.016 \\
 G &= -.008
 \end{aligned}$$

$$R_6 = \frac{-2.90 \times .008 - 2.95 \times .016}{3.90} = -.018$$

$$M_{FG} = 90(-.016 - \frac{1}{2} \times .008 + .018) = -.18$$

$$M_{GF} = 90(-.008 - \frac{1}{2} \times .016 + .018) = .18$$

7.

$$\begin{aligned}
 238G - 34H &= -1.80 \\
 -25G + 388H &= -1.84 \\
 G &= .0080 \\
 H &= .0052
 \end{aligned}$$

$$R_7 = \frac{-2.91 \times .0080 - 2.96 \times .0052}{3.91} = -.0098$$

$$M_{GH} = 134(-.0080 - \frac{1}{2} \times .0052 + .0098) = -.09$$

$$M_{HG} = 134(-.0080 - \frac{1}{2} \times .0052 + .0098) = .09$$

8.

$$\begin{aligned}
 400H - 52I &= -1.88 \\
 -37H + 299I &= 0 \\
 H &= -.0049 \\
 I &= -.0006
 \end{aligned}$$

$$R_8 = \frac{-2.83 \times .0049 - 2.91 \times .0006}{3.83} = -.0040$$

$$M_{HI} = 200(-.0049 - \frac{1}{2} \times .0006 + .0040) = -.20$$

$$M_{IH} = 200(-.0006 - \frac{1}{2} \times .0049 + .0040) = .20$$

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Second Moment Corrections-Load at C

1.

$$\begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= -.67 \\ A &= -.0002 \\ B &= -.0017 \end{aligned}$$

$$R_1 = \frac{-2.91 \times .0002 - 2.83 \times .0017}{3.83} = -.0014$$

$$M_{AB} = 200(-.0002 - \frac{1}{2} \times .0017 + .0014) = .08$$

$$M_{BA} = 200(-.0017 - \frac{1}{2} \times .0002 + .0014) = -.08$$

2.

$$\begin{aligned} 388B - 25C &= -.67 \\ -34B + 238C &= -.72 \\ B &= -.0020 \\ C &= -.0033 \end{aligned}$$

$$R_2 = \frac{-2.96 \times .0020 - 2.91 \times .0033}{3.91} = -.0040$$

$$M_{BC} = 134(-.0020 - \frac{1}{2} \times .0033 + .0040) = .05$$

$$M_{CB} = 134(-.0033 - \frac{1}{2} \times .0020 + .0040) = -.04$$

3.

$$\begin{aligned} 231C - 17D &= .71 \\ -23C + 134D &= .23 \\ C &= .0023 \\ D &= .0033 \end{aligned}$$

$$R_3 = \frac{2.95 \times .0023 + 2.90 \times .0033}{3.90} = .0042$$

$$M_{CD} = 90(.0023 + \frac{1}{2} \times .0033 - .0042) = -.03$$

$$M_{DC} = 90(.0033 + \frac{1}{2} \times .0023 - .0042) = .03$$

4.

$$\begin{aligned} 94D - 24E &= .72 \\ -24D + 135E &= -.10 \\ D &= .0076 \\ E &= .0006 \end{aligned}$$

$$R_4 = \frac{3}{4} (.0076 + .0006) = .0062$$

$$M_{DE} = 95(.0076 + \frac{1}{2} \times .0006 - .0062) = .16$$

$$M_{ED} = 95(.0006 + \frac{1}{2} \times .0076 - .0062) = -.16$$

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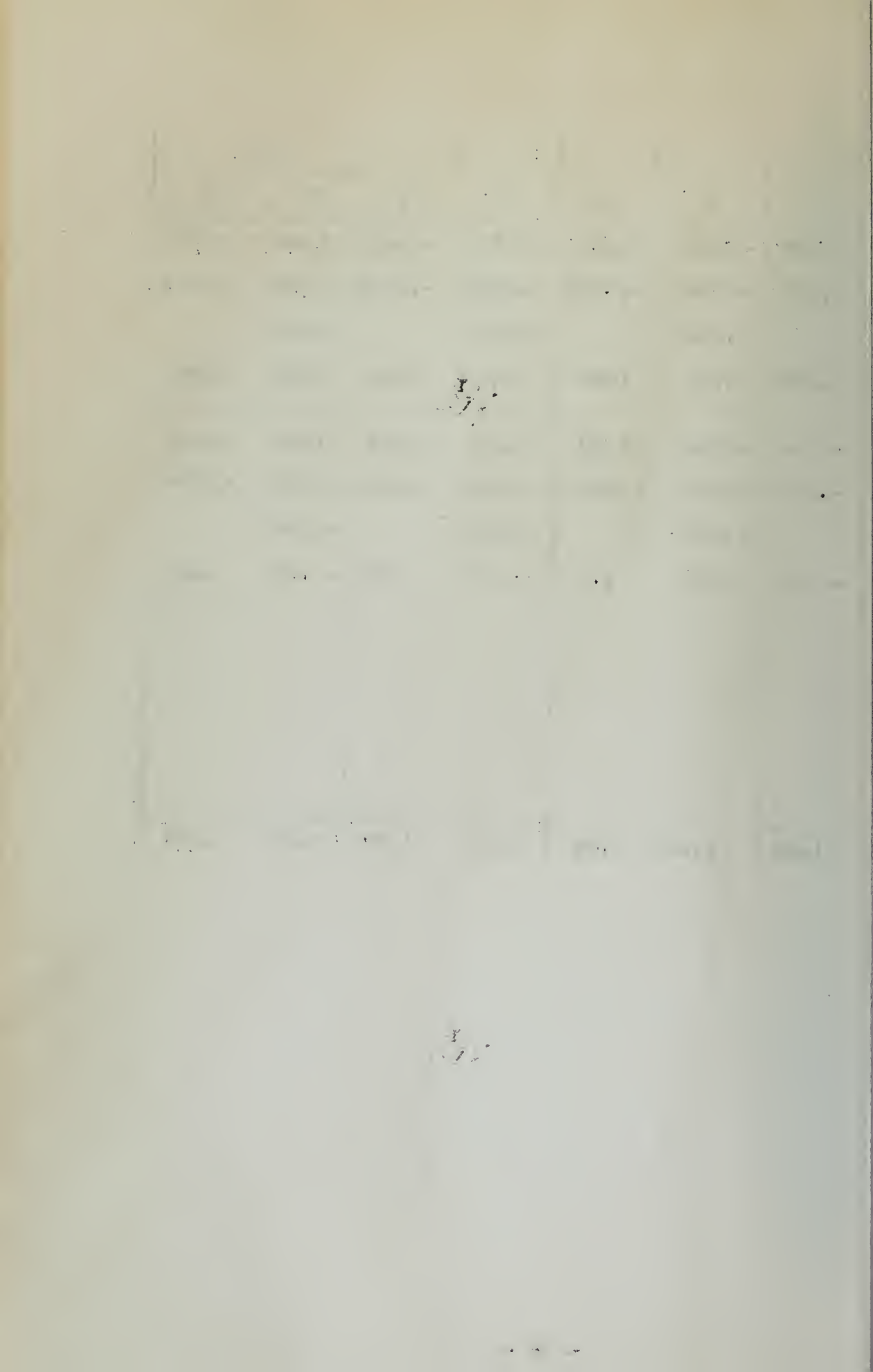
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Load at C

Panel	1		2		3		4	
Joint	A	B	B	C	C	D	D	E
Q	4.98	5.38	4.82	5.24	-2.20	-2.39	-1.87	-1.87
X	.019	.016	.014	.024	-.011	-.020	-.018	-.025
R	.053		.067		-.050		-.052	
M'	-5.20	-5.40	-5.49	-4.82	2.61	2.16	2.09	1.71
Q	0.00	5.49	5.40	-2.61	4.82	-2.09	-2.16	-1.72
X	.0017	.014	.013	-.0091	.020	-0.12	-0.28	-.018
R	.012		-.0031		.0062		-.035	
M''	-.60	.60	.67	-.71	.72	-.72	-.23	.23
Q	0.00	-.67	-.67	-.72	.71	.23	.72	-.10
X	-.0002	-.0017	-.0020	-.0033	.0023	.0033	.0076	.0006
R	-.0014		-.0040		.0042		.0062	
M'''	.08	-.08	.05	-.04	-.03	.03	.16	-.16
M	-5.72	-4.88	-4.77	-5.57	3.29	1.47	2.02	1.78

Jan 1	1887	Jan 1	1887	Jan 1	1887	Jan 1	1887
Jan 2	1887	Jan 2	1887	Jan 2	1887	Jan 2	1887
Jan 3	1887	Jan 3	1887	Jan 3	1887	Jan 3	1887
Jan 4	1887	Jan 4	1887	Jan 4	1887	Jan 4	1887
Jan 5	1887	Jan 5	1887	Jan 5	1887	Jan 5	1887
Jan 6	1887	Jan 6	1887	Jan 6	1887	Jan 6	1887
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Jan 8	1887	Jan 8	1887	Jan 8	1887	Jan 8	1887
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Jan 10	1887	Jan 10	1887	Jan 10	1887	Jan 10	1887
Jan 11	1887	Jan 11	1887	Jan 11	1887	Jan 11	1887
Jan 12	1887	Jan 12	1887	Jan 12	1887	Jan 12	1887
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Jan 28	1887	Jan 28	1887	Jan 28	1887	Jan 28	1887
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5		6		7		8	
E	F	F	G	G	H	H	I
-1.88	-1.88	-1.64	-1.52	-1.74	-1.62	-1.80	-1.66
-.024	-.018	-.014	-.0078	-.0080	-.0046	-.0054	-.0062
-.052		-.034		-.022		-.018	
1.72	1.98	1.44	1.80	1.60	1.88	1.84	1.72
-1.71	-1.44	-1.98	-1.60	-1.80	-1.84	-1.88	0.00
-.016	-.019	-.016	-.008	-.0080	-.0052	-.0049	-.0006
-.026		-.018		-.0098		-.0042	
.10	- .10	- .18	.18	- .09	.09	- .20	.20
1.82	1.88	1.26	1.98	1.51	1.97	1.64	1.92



Influence Lines - First Correction

Load at D

Panel 1

$$299A - 37B = 0$$

$$-52A + 400B = 4.69$$

$$A = .001$$

$$B = .012$$

$$R_1 = .010$$

$$M_{AB} = 200(.001 + \frac{1}{2}x.012 - .01) = -.60$$

$$M_{BA} = 200(.012 + \frac{1}{2}x.001 - .01) = .60$$

Panel 2

$$389B - 25C = 4.60$$

$$-34B + 238C = 4.50$$

$$B = .013$$

$$C = .021$$

$$R_2 = .025$$

$$M_{BC} = 134(.013 + \frac{1}{2}x.021 - .025) = -.27$$

$$M_{CB} = 134(.021 + \frac{1}{2}x.013 - .025) = .27$$

Panel 3

$$231C - 17D = 4.15$$

$$-23C + 134D = -3.14$$

$$C = .016$$

$$D = -.021$$

$$R_3 = -.003$$

$$M_{CD} = 90(.016 - \frac{1}{2}x.021 + .003) = .81$$

$$M_{DC} = 90(-.021 + \frac{1}{2}x.016 + .003) = -.90$$

Panel 4

$$135D - 24E = 3.78$$

$$-24D + 94E = -2.58$$

$$D = .024$$

$$E = -.021$$

$$R_4 = .002$$

$$M_{DE} = 95(.024 - \frac{1}{2}x.021 - .002) = 1.14$$

$$M_{ED} = 95(-.021 + \frac{1}{2}x.024 - .002) = -1.04$$

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1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

100

Panel 5

$$-24F + 94E = -2.56$$

$$135F - 24E = -2.16$$

$$E = -.033$$

$$F = -.022$$

$$R_5 = -.041$$

$$M_{EF} = 95(-.033 - \frac{1}{2}x.022 + .041) = -.28$$

$$M_{FE} = 95(-.022 - \frac{1}{2}x.033 + .041) = .28$$

Panel 6

$$-23G + 134F = -2.97$$

$$231G - 17F = -2.40$$

$$F = -.024$$

$$G = -.012$$

$$R_6 = -.027$$

$$M_{FG} = 90(-.024 - \frac{1}{2}x.012 + .027) = -.27$$

$$M_{GF} = 90(-.012 - \frac{1}{2}x.024 + .027) = .27$$

Panel 7

$$-34H + 238G = -2.70$$

$$389H - 25G = -2.76$$

$$G = -.012$$

$$H = -.008$$

$$R_7 = -.015$$

$$M_{GH} = 134(-.012 - \frac{1}{2}x.008 + .015) = -.13$$

$$M_{HG} = 134(-.008 - \frac{1}{2}x.012 + .015) = .13$$

Panel 8

$$-52I + 400H = -2.82$$

$$299I - 37H = 0$$

$$H = -.001$$

$$I = -.007$$

$$R_8 = -.005$$

$$M_{HI} = 200(0 - \frac{1}{2}x.007 + .005) = .40$$

$$M_{IH} = 200(-.007 - \frac{1}{2}x0 + .005) = -.40$$

1. $\sigma_1 = 1$
 2. $\sigma_2 = 1$
 3. $\sigma_3 = 1$
 4. $\sigma_4 = 1$
 5. $\sigma_5 = 1$

6. $\sigma_6 = 1$
 7. $\sigma_7 = 1$

8. $\sigma_8 = 1$
 9. $\sigma_9 = 1$
 10. $\sigma_{10} = 1$
 11. $\sigma_{11} = 1$

12. $\sigma_{12} = 1$
 13. $\sigma_{13} = 1$

14. $\sigma_{14} = 1$
 15. $\sigma_{15} = 1$
 16. $\sigma_{16} = 1$
 17. $\sigma_{17} = 1$

18. $\sigma_{18} = 1$
 19. $\sigma_{19} = 1$

20. $\sigma_{20} = 1$
 21. $\sigma_{21} = 1$
 22. $\sigma_{22} = 1$
 23. $\sigma_{23} = 1$

24. $\sigma_{24} = 1$
 25. $\sigma_{25} = 1$

Influence Lines - Second Correction - Load at D

Panel 1

$$299A - 37B = 0$$

$$-53A + 400B = .27$$

$$A = 0$$

$$B = .0007$$

$$R_1 = 0$$

$$M_{AB} = 0$$

$$M_{BA} = 0$$

Panel 2

$$389B - 25C = -.60$$

$$-34B + 238C = -.81$$

$$B = -.0018$$

$$C = -.0037$$

$$R_2 = -.0041$$

$$M_{BC} = 134(-.0018 - \frac{1}{2}x.0037 + .0041) = .07$$

$$M_{CB} = 134(-.0037 - \frac{1}{2}x.0018 + .0041) = -.07$$

Panel 3

$$231C - 17D = -.27$$

$$-.23C + 134D = -1.14$$

$$C = -.0019$$

$$D = -.0088$$

$$R_3 = -.0080$$

$$M_{CD} = 90(-.0019 - \frac{1}{2}x.0088 + .0080) = .15$$

$$M_{DC} = 90(-.0088 - \frac{1}{2}x.0019 + .0080) = -.15$$

Panel 4

$$135D - 24E = .90$$

$$-24D + 94E = .28$$

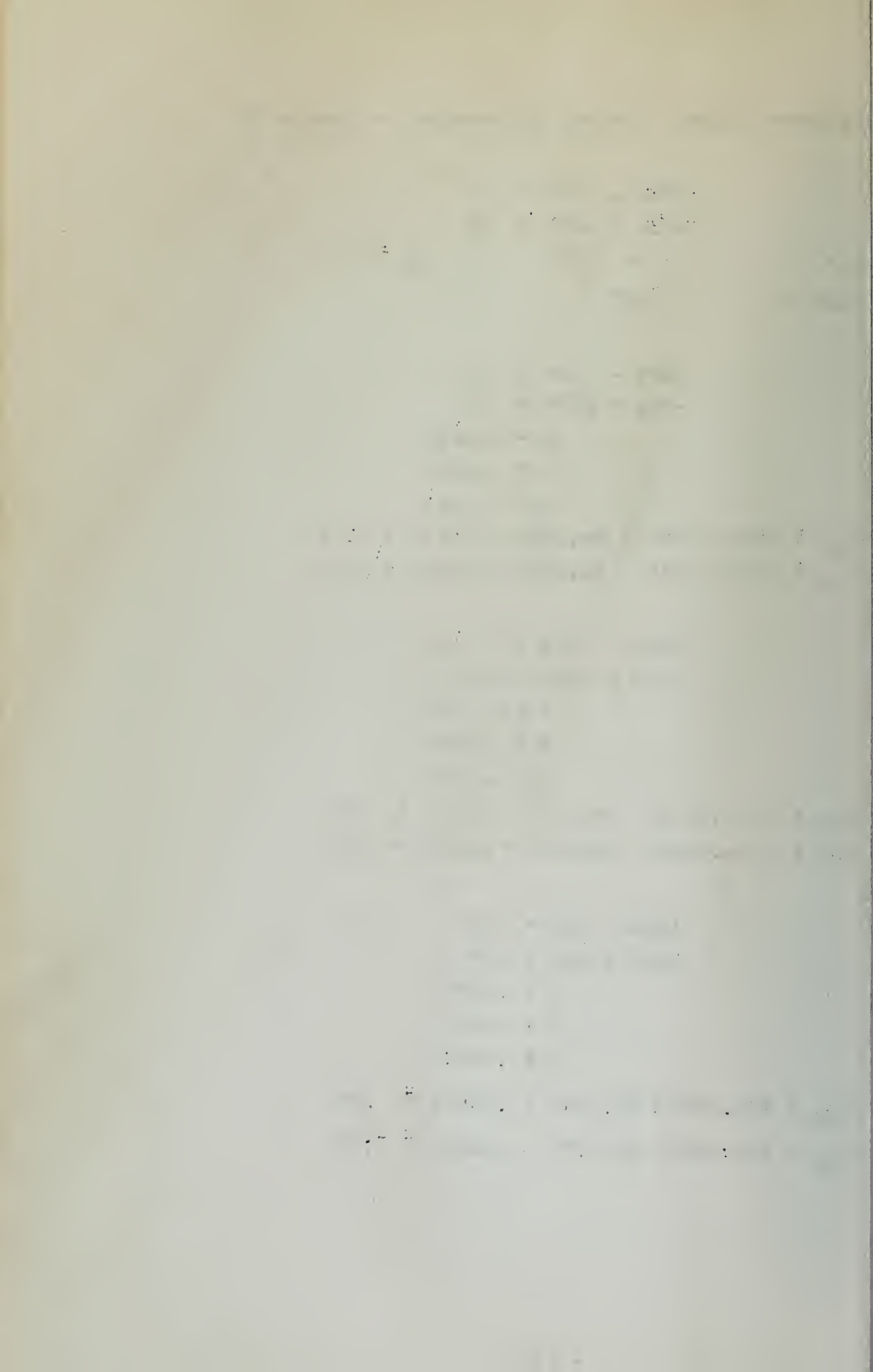
$$D = .0076$$

$$E = .0049$$

$$R_4 = .0094$$

$$M_{DE} = 95(.0076 + \frac{1}{2}x.0049 - .0094) = .07$$

$$M_{ED} = 95(.0049 + \frac{1}{2}x.0076 - .0094) = -.07$$



Panel 5

$$-24F + 94E = 1.04$$

$$135F - 24E = .27$$

$$E = .0121$$

$$F = .0042$$

$$R_5 = .0122$$

$$M_{EF} = 95(.0121 + \frac{1}{2} \times .0042 - .0122) = .19$$

$$M_{FE} = 95(.0042 + \frac{1}{2} \times .0121 - .0122) = -.19$$

Panel 6

$$-23G + 134F = -.28$$

$$231G - 17F = .13$$

$$F = -.0020$$

$$G = .0004$$

$$R_6 = -.0012$$

$$M_{FG} = 90(-.0020 + \frac{1}{2} \times .0004 + .0012) = -.05$$

$$M_{GF} = 90(.0004 - \frac{1}{2} \times .0020 + .0012) = .05$$

Panel 7

$$-34H + 238G = -.27$$

$$389H - 25G = -.40$$

$$G = -.0013$$

$$H = -.0011$$

$$R_7 = -.0018$$

$$M_{GH} = 134(-.0013 - \frac{1}{2} \times .0011 + .0018) = 0$$

$$M_{HG} = 134(-.0011 - \frac{1}{2} \times .0013 + .0018) = 0$$

Panel 8

$$-52I + 400H = -.13$$

$$299I - 37H = 0$$

$$H = -.0003$$

$$R_8 = 0$$

$$M_{IH} = 0$$

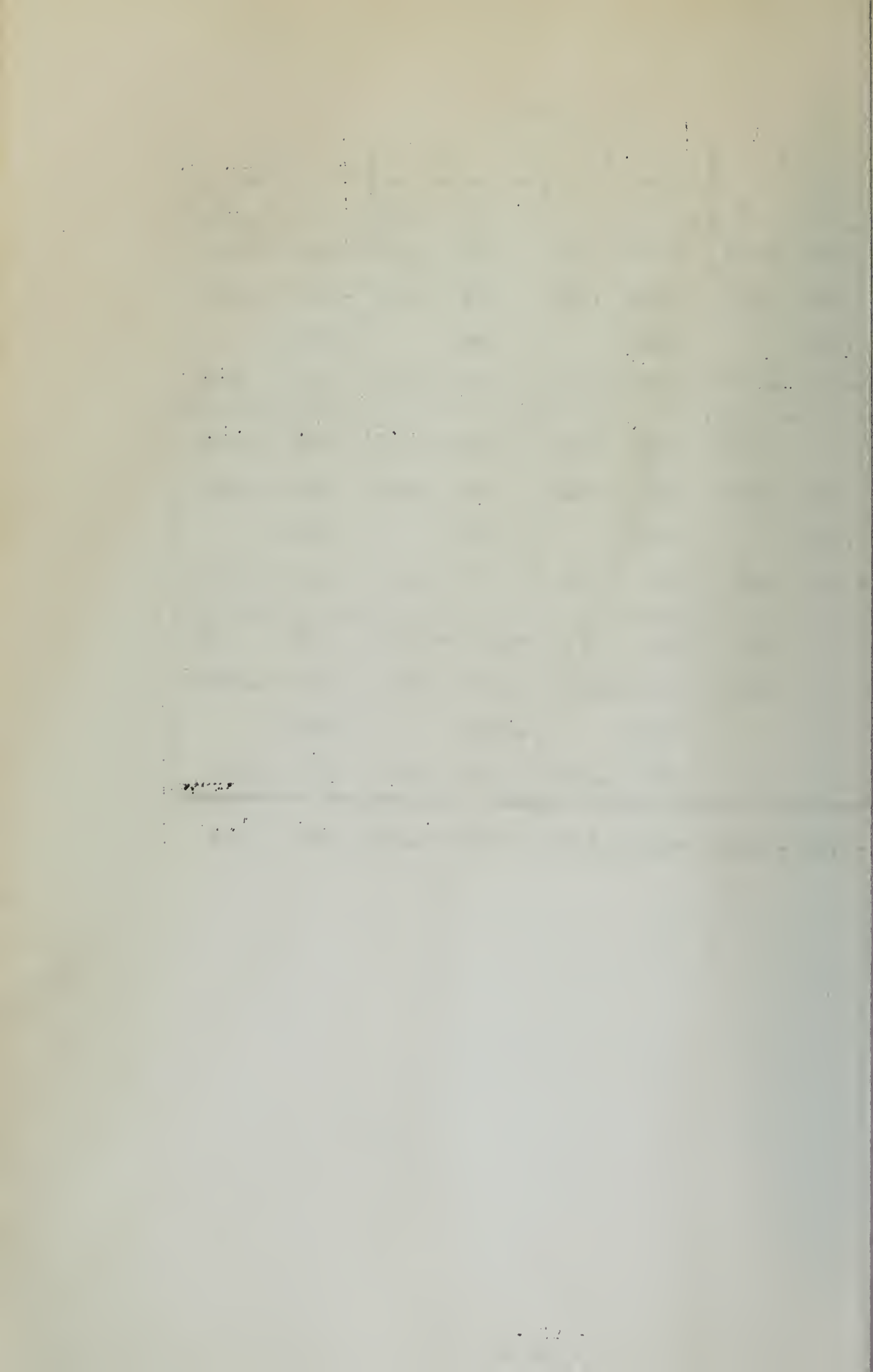
$$I = 0$$

$$M_{HI} = 0$$

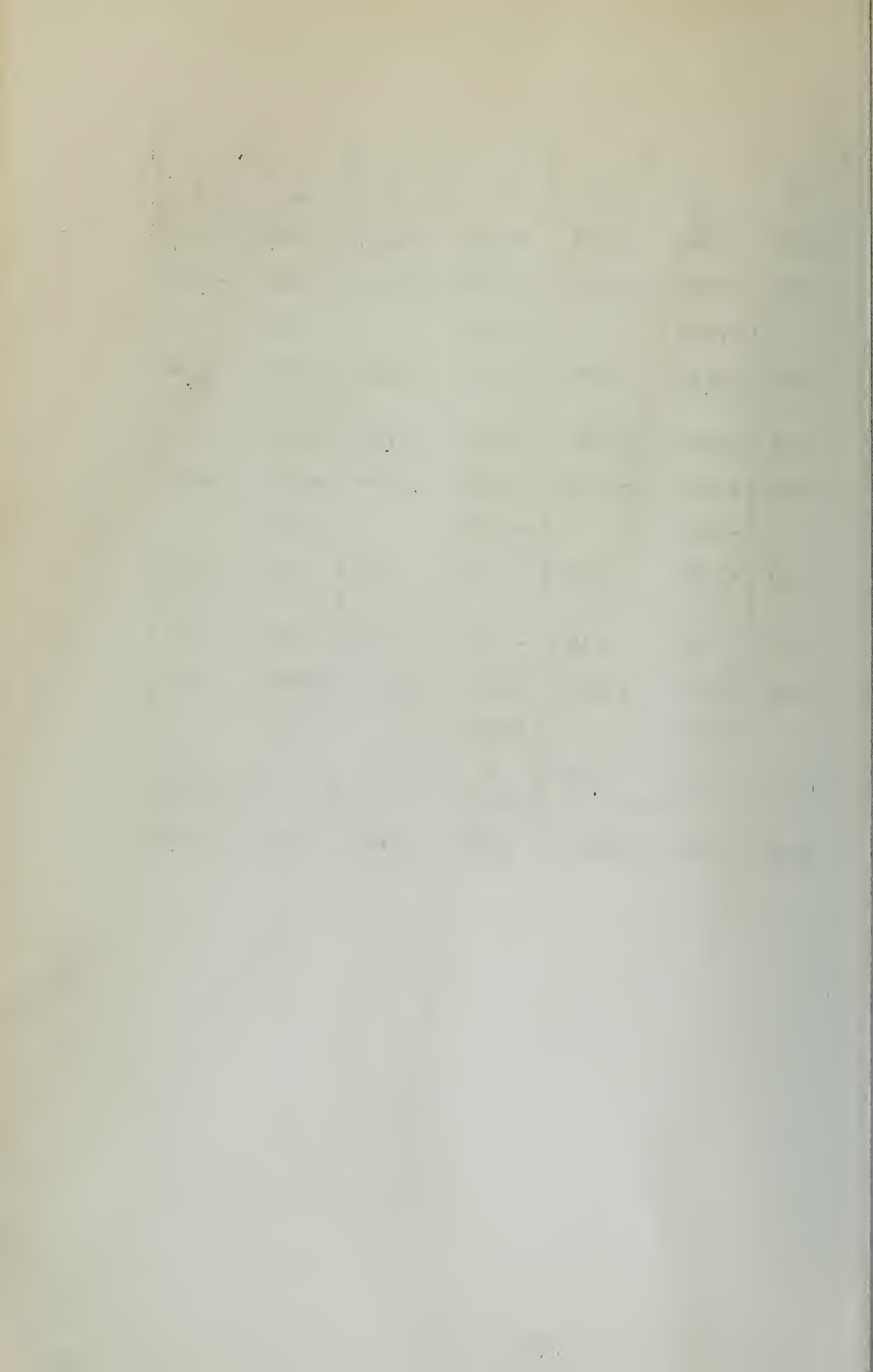
[Faint handwritten notes]

Load at PP3

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|-------|-------|--------|--------|--------|--------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 4.15 | 4.49 | 4.02 | 4.36 | 3.80 | 4.12 | -2.88 | -2.81 |
| α | .016 | .013 | .012 | .020 | .019 | .034 | -.027 | -.037 |
| R | .044 | | .057 | | .086 | | -.078 | |
| M' | -4.40 | -4.60 | -4.69 | -4.15 | -4.50 | -3.78 | 3.14 | 2.56 |
| -Q | 0 | 4.69 | 4.60 | 4.50 | 4.15 | -3.14 | 3.78 | -2.58 |
| α | .001 | .012 | .031 | .021 | .016 | -.021 | .024 | -.021 |
| R | .010 | | .025 | | -.003 | | .002 | |
| M'' | -.60 | .60 | -.27 | .27 | .81 | -.90 | 1.14 | -1.04 |
| -Q | 0 | .27 | -.60 | -.81 | -.27 | -1.14 | .90 | .28 |
| α | 0 | .0007 | -.0018 | -.0037 | -.0019 | -.0083 | .0076 | .0049 |
| R | 0 | | -.0041 | | -.0080 | | .0094 | |
| M''' | 0 | 0 | .07 | -.07 | .15 | -.15 | .07 | -.07 |
| M | -5.00 | -4.00 | -4.89 | -3.95 | -3.54 | -4.83 | 4.35 | 1.45 |



| 5 | | 6 | | 7 | | 8 | |
|-------|-------|--------|-------|--------|--------|--------|-------|
| E | F | F | G | G | H | H | I |
| -2.82 | -2.82 | -2.46 | -2.28 | -2.61 | -2.43 | -2.70 | -2.49 |
| -.036 | -.028 | -.020 | -.012 | -.012 | -.007 | -.008 | -.009 |
| -.078 | | -.051 | | -.033 | | -.026 | |
| 2.58 | 2.97 | 2.16 | 2.70 | 2.40 | 2.82 | 2.76 | 2.58 |
| -2.56 | -2.16 | -2.97 | -2.40 | -2.70 | -2.76 | -2.82 | 0 |
| -.035 | -.022 | -.024 | -.012 | -.012 | -.008 | -.001 | -.007 |
| -.041 | | -.027 | | -.015 | | -.005 | |
| -.26 | .23 | -.27 | .27 | -.13 | .13 | .40 | -.40 |
| 1.04 | .27 | -.28 | .13 | -.27 | -.40 | -.13 | 0 |
| .0121 | .0042 | -.0020 | .0004 | -.0013 | -.0011 | -.0003 | 0 |
| .0122 | | -.0012 | | -.0018 | | 0 | |
| .19 | -.19 | -.05 | .05 | 0 | 0 | 0 | 0 |
| 2.49 | 3.06 | 1.84 | 3.02 | 2.27 | 2.95 | 3.16 | 2.18 |



Influence Lines First Correction Load at E

Panel 1, 8

$$299A - 37B = 0$$

$$-52A + 100B = 3.76$$

$$A = .0012$$

$$B = .0095$$

$$R_1 = .0079$$

$$M_{AB} = 200(.0012 + \frac{1}{2} \times .0095 - .0079) = -.40$$

$$M_{BA} = 200(.0095 + \frac{1}{2} \times .0012 - .0079) = .40$$

Panel 2, 7

$$389B - 25C = -.21$$

$$-34B + 238C = 3.60$$

$$B = .0105$$

$$C = .0172$$

$$R_2 = .208$$

$$M_{EC} = 134(.0105 + \frac{1}{2} \times .0172 - .0208) = -.21$$

$$M_{CE} = 134(.0172 + \frac{1}{2} \times .0105 - .0208) = .21$$

Panel 3, 6

$$231C - 17D = 3.20$$

$$-23C + 134D = 3.96$$

$$C = .0162$$

$$D = .0324$$

$$R_3 = .0364$$

$$M_{CD} = 90(.0162 + \frac{1}{2} \times .0324 - .0362) = -.36$$

$$M_{DC} = 90(.0324 + \frac{1}{2} \times .0162 - .0362) = .36$$

Panel 4, 5

$$135D - 24E = 2.88$$

$$-24D + 94E = -3.44$$

$$D = .0155$$

$$E = -.0326$$

$$R_4 = -.0128$$

$$M_{DE} = 95(.0155 - \frac{1}{2} \times .0326 + .0128) = 1.14$$

$$M_{ED} = 95(-.0326 - \frac{1}{2} \times .0155 + .0128) = -1.14$$

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Influence Lines - Second Correction - Load at E

Panel 1,8

$$299A - 37B = 0$$

$$-52A + 400B = .21$$

$$A = .00007$$

$$B = .00053$$

$$R_1 = .00044$$

$$M_{AB} = 200(.00007 + \frac{1}{2}x.00053 - .00044) = -.02$$

$$M_{BA} = 200(.00053 + \frac{1}{2}x.00007 - .00044) = .02$$

Panel 2,7

$$389B - 25C = -.40$$

$$-34B + 238C = .36$$

$$B = -.00094$$

$$C = .00132$$

$$R_2 = .00027$$

$$M_{BC} = 134(-.00094 + \frac{1}{2}x.00132 - .00027) = -.08$$

$$M_{CB} = 134(.00132 - \frac{1}{2}x.00094 - .00027) = .08$$

Panel 3,6

$$231C - 17D = -.21$$

$$-23C + 134D = -1.14$$

$$C = -.0016$$

$$D = -.0088$$

$$R_3 = -.0077$$

$$M_{CD} = 90(-.0016 - \frac{1}{2}x.0088 + .0077) = .16$$

$$M_{DC} = 90(-.0088 - \frac{1}{2}x.0016 + .0077) = -.16$$

Panel 4,5

$$135D - 24E = -.21$$

$$-24D + 94E = 0$$

$$D = -.0016$$

$$E = -.0004$$

$$R_4 = -.0015$$

$$M_{DE} = 95(-.0016 - \frac{1}{2}x.0004 + .0015) = -.03$$

$$M_{ED} = 95(-.0004 - \frac{1}{2}x.0016 + .0015) = .03$$

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Load at PP-4

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 3.32 | 3.59 | 3.22 | 3.49 | 3.04 | 3.30 | 3.75 | 3.75 |
| α | .012 | .011 | .009 | .016 | .015 | .017 | .036 | .049 |
| R | .035 | | .045 | | .069 | | .10 | |
| M | -3.44 | -3.68 | -3.76 | -3.20 | -3.60 | -2.88 | -3.96 | -3.44 |
| -Q | 0 | 3.76 | 3.68 | 3.60 | 3.20 | 3.96 | 2.88 | -3.44 |
| α | .0012 | .0095 | .0105 | .0172 | .0162 | .0324 | .0155 | -.0326 |
| R | .0079 | | .0208 | | .0364 | | -.0128 | |
| M | -.40 | .40 | -.21 | .21 | -.36 | .36 | 1.14 | -1.14 |
| -Q | 0 | .21 | -.40 | .36 | -.21 | -1.14 | -.36 | -1.14 |
| α | .00007 | .00053 | .00049 | .00132 | -.0016 | -.0088 | -.0016 | -.0004 |
| R | .00044 | | .00027 | | -.0077 | | -.0015 | |
| M | -.02 | .02 | -.08 | .08 | .16 | -.16 | -.03 | .03 |
| M | -3.86 | -3.26 | -4.05 | -2.91 | -3.80 | -2.68 | -2.85 | -4.55 |

| Year | | 1990 | | 1991 | | 1992 | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | | 2026 | | 2027 | | 2028 | | 2029 | | 2030 | | 2031 | | 2032 | | 2033 | | 2034 | | 2035 | | 2036 | | 2037 | | 2038 | | 2039 | | 2040 | | 2041 | | 2042 | | 2043 | | 2044 | | 2045 | | 2046 | | 2047 | | 2048 | | 2049 | | 2050 | | 2051 | | 2052 | | 2053 | | 2054 | | 2055 | | 2056 | | 2057 | | 2058 | | 2059 | | 2060 | | 2061 | | 2062 | | 2063 | | 2064 | | 2065 | | 2066 | | 2067 | | 2068 | | 2069 | | 2070 | | 2071 | | 2072 | | 2073 | | 2074 | | 2075 | | 2076 | | 2077 | | 2078 | | 2079 | | 2080 | | 2081 | | 2082 | | 2083 | | 2084 | | 2085 | | 2086 | | 2087 | | 2088 | | 2089 | | 2090 | | 2091 | | 2092 | | 2093 | | 2094 | | 2095 | | 2096 | | 2097 | | 2098 | | 2099 | | 2100 | | 2101 | | 2102 | | 2103 | | 2104 | | 2105 | | 2106 | | 2107 | | 2108 | | 2109 | | 2110 | | 2111 | | 2112 | | 2113 | | 2114 | | 2115 | | 2116 | | 2117 | | 2118 | | 2119 | | 2120 | | 2121 | | 2122 | | 2123 | | 2124 | | 2125 | | 2126 | | 2127 | | 2128 | | 2129 | | 2130 | | 2131 | | 2132 | | 2133 | | 2134 | | 2135 | | 2136 | | 2137 | | 2138 | | 2139 | | 2140 | | 2141 | | 2142 | | 2143 | | 2144 | | 2145 | | 2146 | | 2147 | | 2148 | | 2149 | | 2150 | | 2151 | | 2152 | | 2153 | | 2154 | | 2155 | | 2156 | | 2157 | | 2158 | | 2159 | | 2160 | | 2161 | | 2162 | | 2163 | | 2164 | | 2165 | | 2166 | | 2167 | | 2168 | | 2169 | | 2170 | | 2171 | | 2172 | | 2173 | | 2174 | | 2175 | | 2176 | | 2177 | | 2178 | | 2179 | | 2180 | | 2181 | | 2182 | | 2183 | | 2184 | | 2185 | | 2186 | | 2187 | | 2188 | | 2189 | | 2190 | | 2191 | | 2192 | | 2193 | | 2194 | | 2195 | | 2196 | | 2197 | | 2198 | | 2199 | | 2200 | | 2201 | | 2202 | | 2203 | | 2204 | | 2205 | | 2206 | | 2207 | | 2208 | | 2209 | | 2210 | | 2211 | | 2212 | | 2213 | | 2214 | | 2215 | | 2216 | | 2217 | | 2218 | | 2219 | | 2220 | | 2221 | | 2222 | | 2223 | | 2224 | | 2225 | | 2226 | | 2227 | | 2228 | | 2229 | | 2230 | | 2231 | | 2232 | | 2233 | | 2234 | | 2235 | | 2236 | | 2237 | | 2238 | | 2239 | | 2240 | | 2241 | | 2242 | | 2243 | | 2244 | | 2245 | | 2246 | | 2247 | | 2248 | | 2249 | | 2250 | | 2251 | | 2252 | | 2253 | | 2254 | | 2255 | | 2256 | | 2257 | | 2258 | | 2259 | | 2260 | | 2261 | | 2262 | | 2263 | | 2264 | | 2265 | | 2266 | | 2267 | | 2268 | | 2269 | | 2270 | | 2271 | | 2272 | | 2273 | | 2274 | | 2275 | | 2276 | | 2277 | | 2278 | | 2279 | | 2280 | | 2281 | | 2282 | | 2283 | | 2284 | | 2285 | | 2286 | | 2287 | | 2288 | | 2289 | | 2290 | | 2291 | | 2292 | | 2293 | | 2294 | | 2295 | | 2296 | | 2297 | | 2298 | | 2299 | | 2300 | | 2301 | | 2302 | | 2303 | | 2304 | | 2305 | | 2306 | | 2307 | | 2308 | | 2309 | | 2310 | | 2311 | | 2312 | | 2313 | | 2314 | | 2315 | | 2316 | | 2317 | | 2318 | | 2319 | | 2320 | | 2321 | | 2322 | | 2323 | | 2324 | | 2325 | | 2326 | | 2327 | | 2328 | | 2329 | | 2330 | | 2331 | | 2332 | | 2333 | | 2334 | | 2335 | | 2336 | | 2337 | | 2338 | | 2339 | | 2340 | | 2341 | | 2342 | | 2343 | | 2344 | | 2345 | | 2346 | | 2347 | | 2348 | | 2349 | | 2350 | | 2351 | | 2352 | | 2353 | | 2354 | | 2355 | | 2356 | | 2357 | | 2358 | | 2359 | | 2360 | | 2361 | | 2362 | | 2363 | | 2364 | | 2365 | | 2366 | | 2367 | | 2368 | | 2369 | | 2370 | | 2371 | | 2372 | | 2373 | | 2374 | | 2375 | | 2376 | | 2377 | | 2378 | | 2379 | | 2380 | | 2381 | | 2382 | | 2383 | | 2384 | | 2385 | | 2386 | | 2387 | | 2388 | | 2389 | | 2390 | | 2391 | | 2392 | | 2393 | | 2394 | | 2395 | | 2396 | | 2397 | | 2398 | | 2399 | | 2400 | | 2401 | | 2402 | | 2403 | | 2404 | | 2405 | | 2406 | | 2407 | | 2408 | | 2409 | | 2410 | | 2411 | | 2412 | | 2413 | | 2414 | | 2415 | | 2416 | | 2417 | | 2418 | | 2419 | | 2420 | | 2421 | | 2422 | | 2423 | | 2424 | | 2425 | | 2426 | | 2427 | | 2428 | | 2429 | | 2430 | | 2431 | | 2432 | | 2433 | | 2434 | | 2435 | | 2436 | | 2437 | | 2438 | | 2439 | | 2440 | | 2441 | | 2442 | | 2443 | | 2444 | | 2445 | | 2446 | | 2447 | | 2448 | | 2449 | | 2450 | | 2451 | | 2452 | | 2453 | | 2454 | | 2455 | | 2456 | | 2457 | | 2458 | | 2459 | | 2460 | | 2461 | | 2462 | | 2463 | | 2464 | | 2465 | | 2466 | | 2467 | | 2468 | | 2469 | | 2470 | | 2471 | | 2472 | | 2473 | | 2474 | | 2475 | | 2476 | | 2477 | | 2478 | | 2479 | | 2480 | | 2481 | | 2482 | | 2483 | | 2484 | | 2485 | | 2486 | | 2487 | | 2488 | | 2489 | | 2490 | | 2491 | | 2492 | | 2493 | | 2494 | | 2495 | | 2496 | | 2497 | | 2498 | | 2499 | | 2500 | | 2501 | | 2502 | | 2503 | | 2504 | | 2505 | | 2506 | | 2507 | | 2508 | | 2509 | | 2510 | | 2511 | | 2512 | | 2513 | | 2514 | | 2515 | | 2516 | | 2517 | | 2518 | | 2519 | | 2520 | | 2521 | | 2522 | | 2523 | | 2524 | | 2525 | | 2526 | | 2527 | | 2528 | | 2529 | | 2530 | | 2531 | | 2532 | | 2533 | | 2534 | | 2535 | | 2536 | | 2537 | | 2538 | | 2539 | | 2540 | | 2541 | | 2542 | | 2543 | | 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2655 | | 2656 | | 2657 | | 2658 | | 2659 | | 2660 | | 2661 | | 2662 | | 2663 | | 2664 | | 2665 | | 2666 | | 2667 | | 2668 | | 2669 | | 2670 | | 2671 | | 2672 | | 2673 | | 2674 | | 2675 | | 2676 | | 2677 | | 2678 | | 2679 | | 2680 | | 2681 | | 2682 | | 2683 | | 2684 | | 2685 | | 2686 | | 2687 | | 2688 | | 2689 | | 2690 | | 2691 | | 2692 | | 2693 | | 2694 | | 2695 | | 2696 | | 2697 | | 2698 | | 2699 | | 2700 | | 2701 | | 2702 | | 2703 | | 2704 | | 2705 | | 2706 | | 2707 | | 2708 | | 2709 | | 2710 | | 2711 | | 2712 | | 2713 | | 2714 | | 2715 | | 2716 | | 2717 | | 2718 | | 2719 | | 2720 | | 2721 | | 2722 | | 2723 | | 2724 | | 2725 | | 2726 | | 2727 | | 2728 | | 2729 | | 2730 | | 2731 | | 2732 | | 2733 | | 2734 | | 2735 | | 2736 | | 2737 | | 2738 | | 2739 | | 2740 | | 2741 | | 2742 | | 2743 | | 2744 | | 2745 | | 2746 | | 2747 | | 2748 | | 2749 | | 2750 | | 2751 | | 2752 | | 2753 | | 2754 | | 2755 | | 2756 | | 2757 | | 2758 | | 2759 | | 2760 | | 2761 | | 2762 | | 2763 | | 2764 | | 2765 | | 2766 | | 2767 | | 2768 | | 2769 | | 2770 | | 2771 | | 2772 | | 2773 | | 2774 | | 2775 | | 2776 | | 2777 | | 2778 | | 2779 | | 2780 | | 2781 | | 2782 | | 2783 | | 2784 | | 2785 | | 2786 | | 2787 | | 2788 | | 2789 | | 2790 | | 2791 | | 2792 | | 2793 | | 2794 | | 2795 | | 2796 | | 2797 | | 2798 | | 2799 | | 2800 | | 2801 | | 2802 | | 2803 | | 2804 | | 2805 | | 2806 | | 2807 | | 2808 | | 2809 | | 2810 | | 2811 | | 2812 | | 2813 | | 2814 | | 2815 | | 2816 | | 2817 | | 2818 | | 2819 | | 2820 | | 2821 | | 2822 | | 2823 | | 2824 | | 2825 | | 2826 | | 2827 | | 2828 | | 2829 | | 2830 | | 2831 | | 2832 | | 2833 | | 2834 | | 2835 | | 2836 | | 2837 | | 2838 | | 2839 | | 2840 | | 2841 | | 2842 | | 2843 | | 2844 | | 2845 | | 2846 | | 2847 | | 2848 | | 2849 | | 2850 | | 2851 | | 2852 | | 2853 | | 2854 | | 2855 | | 2856 | | 2857 | | 2858 | | 2859 | | 2860 | | 2861 | | 2862 | | 2863 | | 2864 | | 2865 | | 2866 | | 2867 | | 2868 | | 2869 | | 2870 | | 2871 | | 2872 | | 2873 | | 2874 | | 2875 | | 2876 | | 2877 | | 2878 | | 2879 | | 2880 | | 2881 | | 2882 | | 2883 | | 2884 | | 2885 | | 2886 | | 2887 | | 2888 | | 2889 | | 2890 | | 2891 | | 2892 | | 2893 | | 2894 | | 2895 | | 2896 | | 2897 | | 2898 | | 2899 | | 2900 | | 2901 | | 2902 | | 2903 | | 2904 | | 2905 | | 2906 | | 2907 | | 2908 | | 2909 | | 2910 | | 2911 | | 2912 | | 2913 | | 2914 | | 2915 | | 2916 | | 2917 | | 2918 | | 2919 | | 2920 | | 2921 | | 2922 | | 2923 | | 2924 | | 2925 | | 2926 | | 2927 | | 2928 | | 2929 | | 2930 | | 2931 | | 2932 | | 2933 | | 2934 | | 2935 | | 2936 | | 2937 | | 2938 | | 2939 | | 2940 | | 2941 | | 2942 | | 2943 | | 2944 | | 2945 | | 2946 | | 2947 | | 2948 | | 2949 | | 2950 | | 2951 | | 2952 | | 2953 | | 2954 | | 2955 | | 2956 | | 2957 | | 2958 | | 2959 | | 2960 | | 2961 | | 2962 | | 2963 | | 2964 | | 2965 | | 2966 | | 2967 | | 2968 | | 2969 | | 2970 | | 2971 | | 2972 | | 2973 | | 2974 | | 2975 | | 2976 | | 2977 | | 2978 | | 2979 | | 2980 | | 2981 | | 2982 | | 2983 | | 2984 | | 2985 | | 2986 | | 2987 | | 2988 | | 2989 | | 2990 | | 2991 | | 2992 | | 2993 | | 2994 | | 2995 | | 2996 | | 2997 | | 2998 | | 2999 | | 3000 | | 3001 | | 3002 | | 3003 | | 3004 | | 3005 | | 3006 | | 3007 | | 3008 | | 3009 | | 3010 | | 3011 | | 3012 | | 3013 | | 3014 | | 3015 | | 3016 | | 3017 | | 3018 | | 3019 | | 3020 | |
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| 5 | | 6 | | 7 | | 8 | |
|-------|--------|--------|--------|---------|--------|---------|---------|
| F | F | F | G | G | H | H | I |
| -5.73 | -3.78 | -3.28 | -3.04 | -3.48 | -3.24 | -3.60 | -3.32 |
| .049 | -.036 | -.027 | -.015 | -.016 | -.009 | -.011 | -.012 |
| .10 | | -.069 | | -.045 | | -.035 | |
| 3.44 | 3.96 | 2.88 | 3.60 | 3.20 | 3.76 | 3.68 | 3.44 |
| 3.44 | -2.88 | -3.96 | -3.20 | -3.60 | -3.68 | -3.76 | 0 |
| .0326 | -.0155 | -.0324 | -.0162 | -.0172 | -.0105 | -.0095 | -.0012 |
| .0128 | | -.0364 | | -.0208 | | -.0079 | |
| 1.14 | -1.14 | -.36 | .36 | -.21 | .21 | -.40 | .40 |
| 1.14 | .36 | 1.14 | .21 | -.36 | .40 | -.21 | 0 |
| .0004 | .0016 | .0088 | .0016 | -.00132 | .00094 | -.00053 | -.00007 |
| .0015 | | .0077 | | -.00027 | | -.00044 | |
| -.03 | .03 | .16 | -.16 | -.08 | .08 | -.02 | .02 |
| 4.55 | 2.85 | 2.68 | 3.80 | 2.91 | 4.05 | 3.26 | 3.86 |

Moment Computations - Web Members

Member AA'

$$Dh = 3140 \text{ fk}$$

$$hh \text{ E-60} = 2755$$

$$\text{Impact} = \underline{590}$$

$$\text{Total} = 6485$$

$$hh \text{ H-15-S12-44} = 367$$

$$\text{Conc.} = 86$$

$$\text{Impact} = \underline{62}$$

$$\text{Total} = 515$$

$$\text{Sidewalk} = 222$$

$$\text{Design Moment} = 11,762 \text{ fk}$$

Member BB'

$$Dh = 5180 \text{ fk}$$

$$hh \text{ E-60} = 4423$$

$$\text{Impact} = \underline{947}$$

$$\text{Total} = 10,550$$

$$hh \text{ H15-S12-44} = 606$$

$$\text{Conc.} = 142$$

$$\text{Impact} = \underline{102}$$

$$\text{Total} = 850$$

$$\text{Sidewalk} = 362$$

$$\text{Design Moment} = 11,762 \text{ fk}$$

Member CC'

$$Dh = 3258 \text{ fk}$$

$$hh \text{ E-60} = 2882$$

$$\text{Impact} = \underline{626}$$

$$\text{Total} = 6766$$

$$hh \text{ H15-S12-44} = 381$$

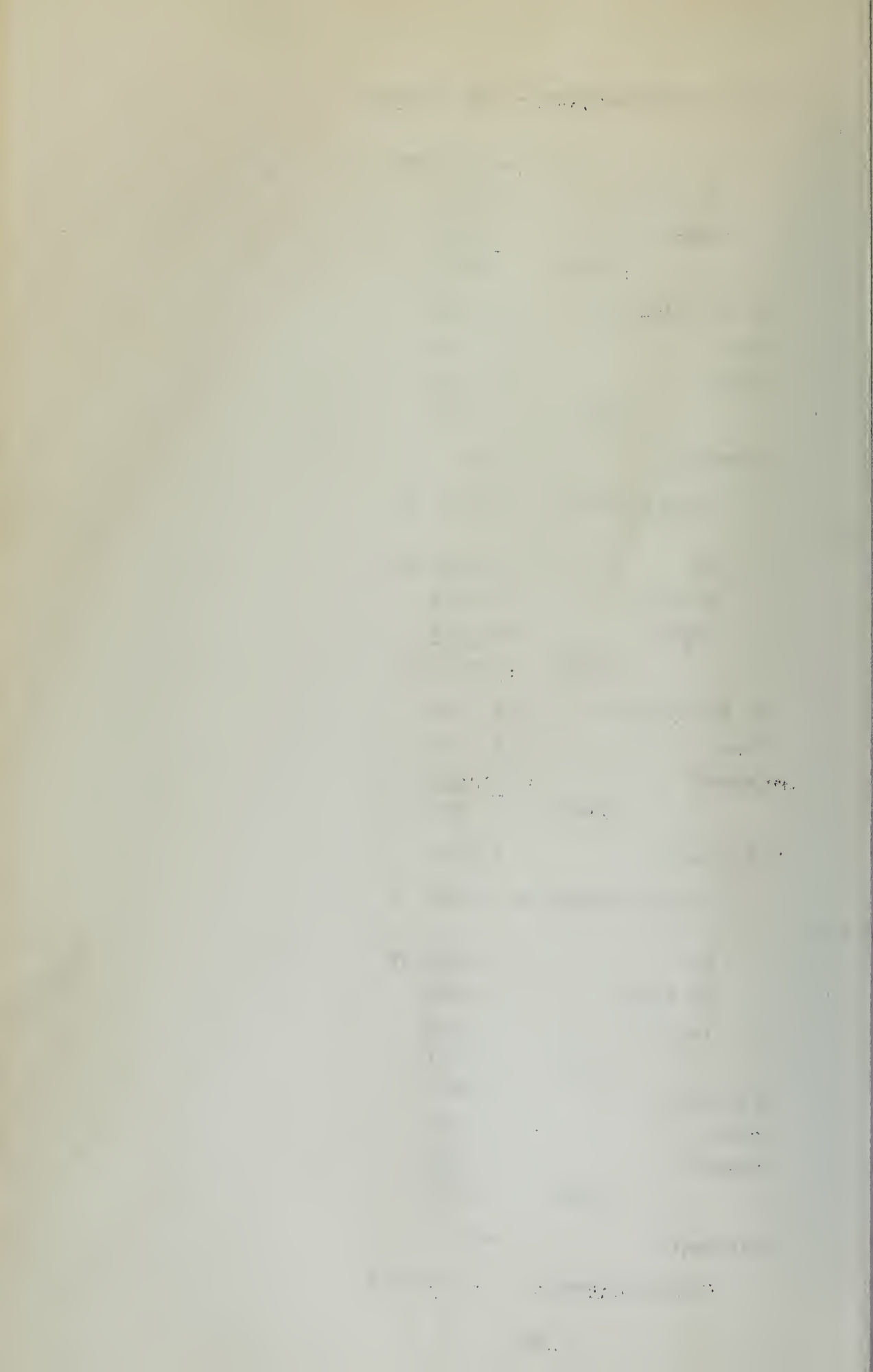
$$\text{Conc.} = 109$$

$$\text{Impact} = \underline{77}$$

$$\text{Total} = 567$$

$$\text{Sidewalk} = 242$$

$$\text{Design Moment} = 7,575 \text{ fk}$$



Member DE

| | | |
|---------------|---|------------|
| Dh | = | 1830 |
| hh-E-60 | = | 1652 |
| Impact | = | <u>436</u> |
| Total | | 3948 |
| hr H15-S12-44 | = | 215 |
| Conc. | = | 79 |
| Impact | = | <u>53</u> |
| Total | | 347 |
| Sidewalk | = | 152 |
| Design Moment | = | 4,447 |

Member EE'

| | | |
|---------------|---|------------|
| Dh | = | 1156 fk |
| hh-E-60 | = | 1110 |
| Impact | = | <u>389</u> |
| Total | | 2655 |
| hr h15-S12-44 | = | 135 |
| Conc. | = | 64 |
| Impact | = | <u>42</u> |
| Total | | 241 |
| Sidewalk | = | 104 |
| Design Moment | = | 3000 fk |

Moment Computations - Chord Members

Member AB

| | | | |
|---------------|---|------------|----|
| DL | = | 3140 | fk |
| LL-E60 | = | 2755 | |
| Impact | = | <u>590</u> | |
| Total | | 6485 | |
| LL HL5-SL2-44 | = | 367 | |
| Conc. | = | 86 | |
| Impact | = | <u>62</u> | |
| Total | | 515 | |
| Sidewalk | = | 222 | |
| Design Moment | = | 7,222 | |

Member BC

| | | | |
|---------------|---|------------|----|
| DL | = | 2330 | fk |
| LL-E60 | = | 2128 | |
| Impact | = | <u>454</u> | |
| Total | | 4912 | |
| LL HL5-SL2-44 | = | 273 | |
| Conc. | = | 80 | |
| Impact | = | <u>55</u> | |
| Total | | 408 | |
| Sidewalk | = | 172 | |
| Design Moment | = | 5,492 | fk |

Member CD

| | | | |
|---------------|---|------------|----|
| DL | = | 1525 | fk |
| LL-E60 | = | 1382 | |
| Impact | = | <u>321</u> | |
| Total | = | 3128 | |
| LL H15-S12-44 | = | 179 | |
| Conc. | = | 61 | |
| Impact | = | <u>41</u> | |
| Total | = | 281 | |
| Sidewalk | = | 120 | |
| Design Moment | = | 3,529 | fk |

Member DE

| | | | |
|---------------|---|------------|----|
| DL | = | 1135 | fk |
| LL-E60 | = | 1088 | |
| Impact | = | <u>327</u> | |
| Total | = | 2550 | |
| LL H15-S12-44 | = | 133 | |
| Conc. | = | 62 | |
| Impact | = | <u>37</u> | |
| Total | = | 232 | |
| Sidewalk | = | 95 | |
| Design Moment | = | 2,877 | fk |

Influence Line Computations.

Load at B

Panel #1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)1} = 5.77$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{.875 \times 30 - .0866 \times 26.25}{2(2 - .0866)1} = 6.28$$

Panel #2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)} = -1.15$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{-.125 \times 30 - .0443 \times 22.5}{2(2 - .0443)1} = -1.21$$

Panel #3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)1} = -1.13$$

$$-Q_D = \frac{-.125 \times 30 - .0482 \times 18.75}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{-.125 \times 30 - .0482 \times 18.75}{2(2 - .0482)1} = -1.19$$

Panel #4

$$-Q_D = \frac{-1(.125 \times 30)}{4} = -.94$$

$$-Q_E = \frac{-.125 \times 30}{4} = -.94$$

$$Q_{R4} = \frac{-.125 \times 30}{4} = -.94$$

[illegible]

1

10

Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -0.94$$

$$-Q_F = \frac{-.125 \times 30}{4} = -0.94$$

$$Q_{R5} = \frac{-.125 \times 30}{4 \times 1} = -0.94$$

Panel 6

$$-Q_G = \frac{(.0507 \times 1 - 1)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)1} = -0.78$$

$$-Q_F = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -0.82$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)1} = -0.82$$

Panel 7

$$-Q_H = \frac{(.0463 \times 1 - 1)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)1} = -0.83$$

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -0.87$$

$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)1} = -0.87$$

Panel 8

$$-Q_I = \frac{(.0942 \times 1 - 1)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)1} = -0.81$$

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

Load at C

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)1} = 4.89$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{.75 \times 30 - .0866 \times 22.5}{2(2 - .0866)1} = 5.38$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)1} = 4.96$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{.75 \times 30 - .0443 \times 45}{2(2 - .0443)1} = 5.23$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)1} = -2.36$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{-.25 \times 30 - .0482 \times 37.5}{2(2 - .0482)1} = -2.38$$

Panel 4

$$-Q_D = \frac{-1(.25 \times 30)}{4} = -1.87$$

$$-Q_E = \frac{-.25 \times 30}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4} = -1.87$$

Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -1.88$$

Panel 6

$$-Q_E = -1.64$$

$$-Q_G = -1.56$$

$$Q_{R6} = -1.64$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.66$$

$$Q_{R7} = -1.74$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.62$$

$$Q_{R8} = -1.80$$

11-15

11-16

11-17

11-18

11-19

11-20

11-21

11-22

11-23

11-24

11-25

Load at D

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)1} = 4.12$$

$$-Q_B = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)1} = 4.49$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)1} = 4.14$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{.625 \times 30 - .0443 \times 37.5}{2(2 - .0443)1} = 4.36$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)1} = 3.91$$

$$-Q_D = \frac{.625 \times 30 - .0482 \times 56.25}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{.625 \times 30 - .0482 \times 56.25}{2(2 - .0482)} = 4.12$$

Panel 4

$$-Q_D = \frac{-1(.375 \times 30)}{4} = -2.82$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.82$$

$$Q_{R4} = \frac{-.375 \times 30}{4} = -2.82$$

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R5} = -2.82$$

Panel 6

$$-Q_F = -2.46$$

$$-Q_G = -2.34$$

$$Q_{R6} = -2.46$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.49$$

$$Q_{R7} = -2.61$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.43$$

$$Q_{R8} = -2.70$$



Load at E

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)1} = 3.26$$

$$-Q_B = \frac{.5 \times 30 - .0866 \times 15}{2(2 - .0866)} = 3.59$$

$$Q_{R1} = \frac{.5 \times 30 - .0866 \times 15}{2(2 - .0866)1} = 3.59$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)1} = 3.31$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R2} = \frac{.5 \times 30 - .0443 \times 30}{2(2 - .0443)1} = 3.49$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)1} = 3.13$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

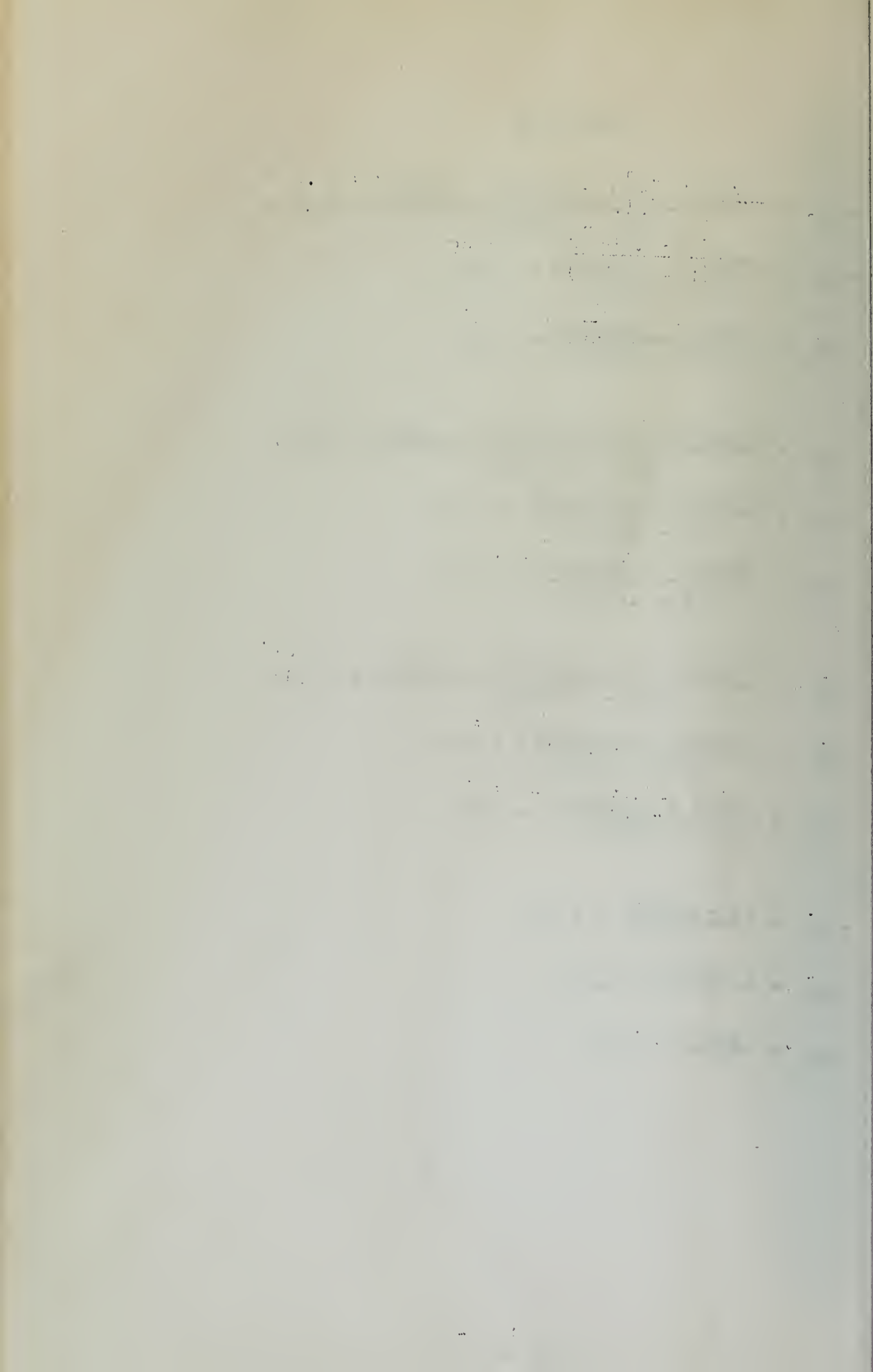
$$Q_{R3} = \frac{.5 \times 30 - .0482 \times 45}{2(2 - .0482)1} = 3.30$$

Panel 4

$$-Q_D = \frac{-1(-.5 \times 30)}{4} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R4} = \frac{.5 \times 30}{4} = 3.75$$



Panel 5

$$-Q_E = -3.76$$

$$-Q_F = -3.76$$

$$Q_{R5} = -3.76$$

Panel 6

$$-Q_E = -3.28$$

$$-Q_G = -3.12$$

$$Q_{R6} = -3.28$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.32$$

$$Q_{R7} = -3.48$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.24$$

$$Q_{R8} = -3.60$$

Equations for Determining Joint Constants

Panel 1

$$\left[1.5x1 + 1 + \frac{(3 - .0866)(.0942x1 - 1)}{2(2 - .0866)} \right] A + \left[\frac{1}{2} + \frac{(3 - 2x.0866)(.0942x1 - 1)}{2(2 - .0866)} \right] B = -Q_A$$

$$1.82A - .17B = -Q_A$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0866)1}{2(2 - .0866)} \right] B + \left[\frac{1}{2} - \frac{(3 - .0866)1}{2(2 - .0866)} \right] A = -Q_B$$

$$1.76B - .26A = -Q_B$$

Panel 2

$$\left[1.5x1 + 1 + \frac{(3 - .0443)(.0463x1 - 1)}{2(2 - .0443)} \right] B + \left[\frac{1}{2} + \frac{(3 - 2x.0443)(.0463x1 - 1)}{2(2 - .0443)} \right] C = -Q_B$$

$$1.78B - .21C = -Q_B$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0443)1}{2(2 - .0443)} \right] C + \left[\frac{1}{2} + \frac{(3 - .0443)1}{2(2 - .0443)} \right] B = -Q_C$$

$$1.76C - .26B = -Q_C$$

• • • • •

Panel 3

$$\left[1.5x1 + 1 + \frac{(3 - .0482)(.0507x1 - 1)}{2(2 - .0482)} \right] C \\ + \left[\frac{1}{2} + \frac{(3 - 2x.0482)(.0507x1 - 1)}{2(2 - .0482)} \right] D = -Q_C$$

$$1.78C - .21D = -Q_C$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0482)x1}{2(2 - .0482)} \right] D \\ + \left[\frac{1}{2} - \frac{(3 - .0482)x1}{2(2 - .0482)} \right] C = -Q_D$$

$$1.76D - .26C = -Q_D$$

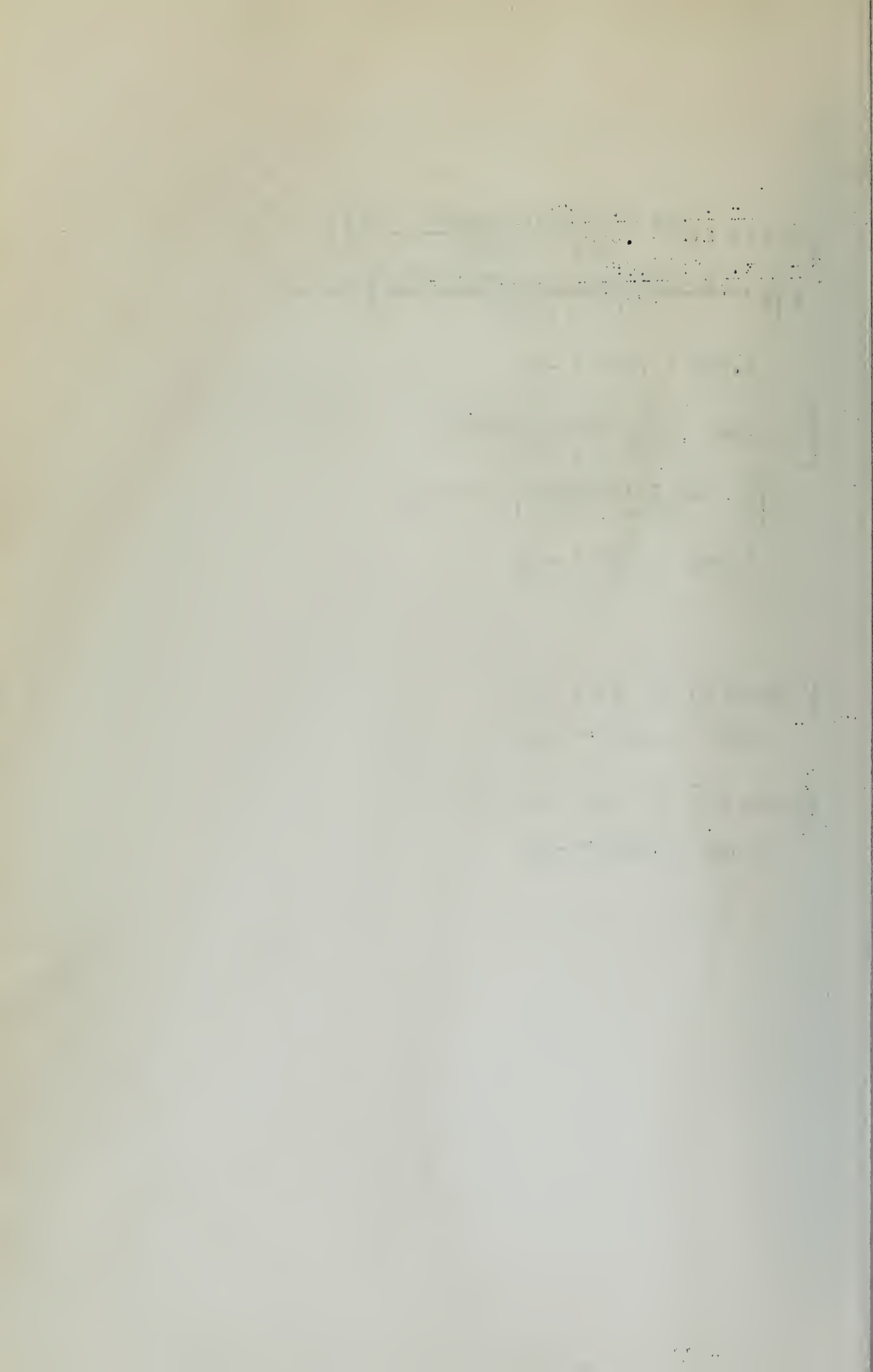
Panel 4

$$\left[1.5x1 + \frac{1}{4} \right] D - \frac{1}{4}E = -Q_D$$

$$1.75D - .25E = -Q_D$$

$$\left[1.5x1 + \frac{1}{4} \right] E - \frac{1}{4}D = -Q_E$$

$$1.75E - .25D = -Q_E$$



Joint Constant Computation - Load at B

Panel 1

$$1.82A - .17B = 5.77$$

$$-.26A + 1.76B = 6.28$$

$$A = 3.56 \quad B = 4.09$$

$$R_1 = \frac{2.91 \times 3.56 + 2.83 \times 4.09}{3.82} + 6.28 = 12.03$$

$$M_{FL} = (3.56 + \frac{4.09}{2} - 12.03) = -6.43$$

$$M_{BA} = (4.09 + \frac{3.56}{2} - 12.03) = -6.16$$

Panel 2

$$1.78B - .21C = -1.15$$

$$-.26B + 1.76C = -1.21$$

$$B = -.74 \quad C = -.80$$

$$R_2 = \frac{-2.96 \times .74 - 2.91 \times .80}{3.92} - 1.21 = -2.36$$

$$M_{BC} = (-.74 - \frac{.80}{2} + 2.36) = 1.22$$

$$M_{CB} = (-.80 - \frac{.74}{2} + 2.36) = 1.19$$

Panel 3

$$1.78C - .21D = -1.13$$

$$-.26C + 1.76D = -1.19$$

$$C = -.73 \quad D = -.78$$

$$R_3 = \frac{-2.95 \times .73 - 2.90 \times .78}{3.90} - 1.19 = -2.33$$

$$M_{CD} = (-.73 - \frac{.78}{2} + 2.33) = 1.21$$

$$M_{DC} = (-.78 - \frac{.73}{2} + 2.33) = 1.19$$

Panel 4

$$1.75D - .25E = -.94$$

$$-.25D + 1.75E = -.94$$

$$D = -.63 \quad E = -.63$$

$$R_4 = \frac{3}{4}(-.63 - .63) - .94 = -1.88$$

$$M_{DE} = (-.63 - \frac{.63}{2} + 1.88) = .94$$

$$M_{ED} = (-.63 - \frac{.63}{2} + 1.88) = .94$$

Panel 5

$$1.75E - .25F = -0.94$$

$$-.25E + 1.75F = -0.94$$

$$E = -0.63 \quad F = -0.63$$

$$R_5 = 3/4(-0.63 - 0.63) - 0.94 = -1.88$$

$$M_{EF} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

$$M_{FE} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

Panel 6

$$1.76F - .26G = -0.82$$

$$-.21F + 1.78G = -0.78$$

$$F = -0.54 \quad G = -0.50$$

$$R_6 = \frac{-2.90 \times .54 - 2.95 \times .50}{3.90} - .82 = -1.60$$

$$M_{FG} = 1(-0.54 - \frac{1}{2} \times 0.50 + 1.60) = 0.81$$

$$M_{GF} = 1(-0.50 - \frac{1}{2} \times 0.54 + 1.60) = 0.83$$

Panel 7

$$1.76G - .26H = -0.87$$

$$-.20G + 1.78H = -0.83$$

$$G = -0.57 \quad H = -0.53$$

$$R_7 = \frac{-2.91 \times .57 - 2.96 \times 0.53}{3.91} - 0.87 = 1.70$$

$$M_{GH} = 1(-0.57 - \frac{1}{2} \times 0.53 + 1.70) = .87$$

$$M_{HG} = 1(-0.53 - \frac{1}{2} \times 0.57 + 1.70) = .89$$

Panel 8

$$1.76H - .26I = -0.90$$

$$-.17H + 1.92I = -0.81$$

$$H = -0.59 \quad I = -0.50$$

$$R_8 = \frac{-2.83 \times .59 - 2.91 \times .50}{3.83} - 0.90 = -1.71$$

$$M_{HI} = 1(-0.59 - \frac{1}{2} \times 0.50 + 1.71) = 0.87$$

$$M_{IH} = 1(-0.50 - \frac{1}{2} \times 0.59 + 1.71) = 0.93$$

London, September 18, 1891

My dear Mr. Brewster

I have just received your letter of the 17th

and am glad to hear

from you and that you are well

and happy

I am very glad to hear that you are well

and that you are enjoying your trip

very much

Yours

W. Brewster

My dear Mr. Brewster

I have

just received

your letter of the 17th and am glad to hear

from you and that you are well

and that you are enjoying your trip

very much

I am very glad to hear that you are well

and that you are enjoying your trip

very much

Yours

Panel 5

$$1.75E - .25F = -0.94$$

$$-.25E + 1.75F = -0.94$$

$$E = -0.63 \quad F = -0.63$$

$$R_5 = 3/4(-0.63 - 0.63) - 0.94 = -1.88$$

$$M_{EF} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

$$M_{FE} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

Panel 6

$$1.76F - .26G = -0.82$$

$$-.21F + 1.78G = -0.78$$

$$F = -0.54 \quad G = -0.50$$

$$R_6 = \frac{-2.90 \times .54 - 2.95 \times .50}{3.90} - .82 = -1.60$$

$$M_{FG} = 1(-0.54 - \frac{1}{2} \times 0.50 + 1.60) = 0.81$$

$$M_{GF} = 1(-0.50 - \frac{1}{2} \times 0.54 + 1.60) = 0.83$$

Panel 7

$$1.76G - .26H = -0.87$$

$$-.20G + 1.78H = -0.83$$

$$G = -0.57 \quad H = -0.53$$

$$R_7 = \frac{-2.91 \times .57 - 2.96 \times 0.53}{3.91} - 0.87 = 1.70$$

$$M_{GH} = 1(-0.57 - \frac{1}{2} \times 0.53 + 1.70) = .87$$

$$M_{HG} = 1(-0.53 - \frac{1}{2} \times 0.57 + 1.70) = .89$$

Panel 8

$$1.76H - .26I = -0.90$$

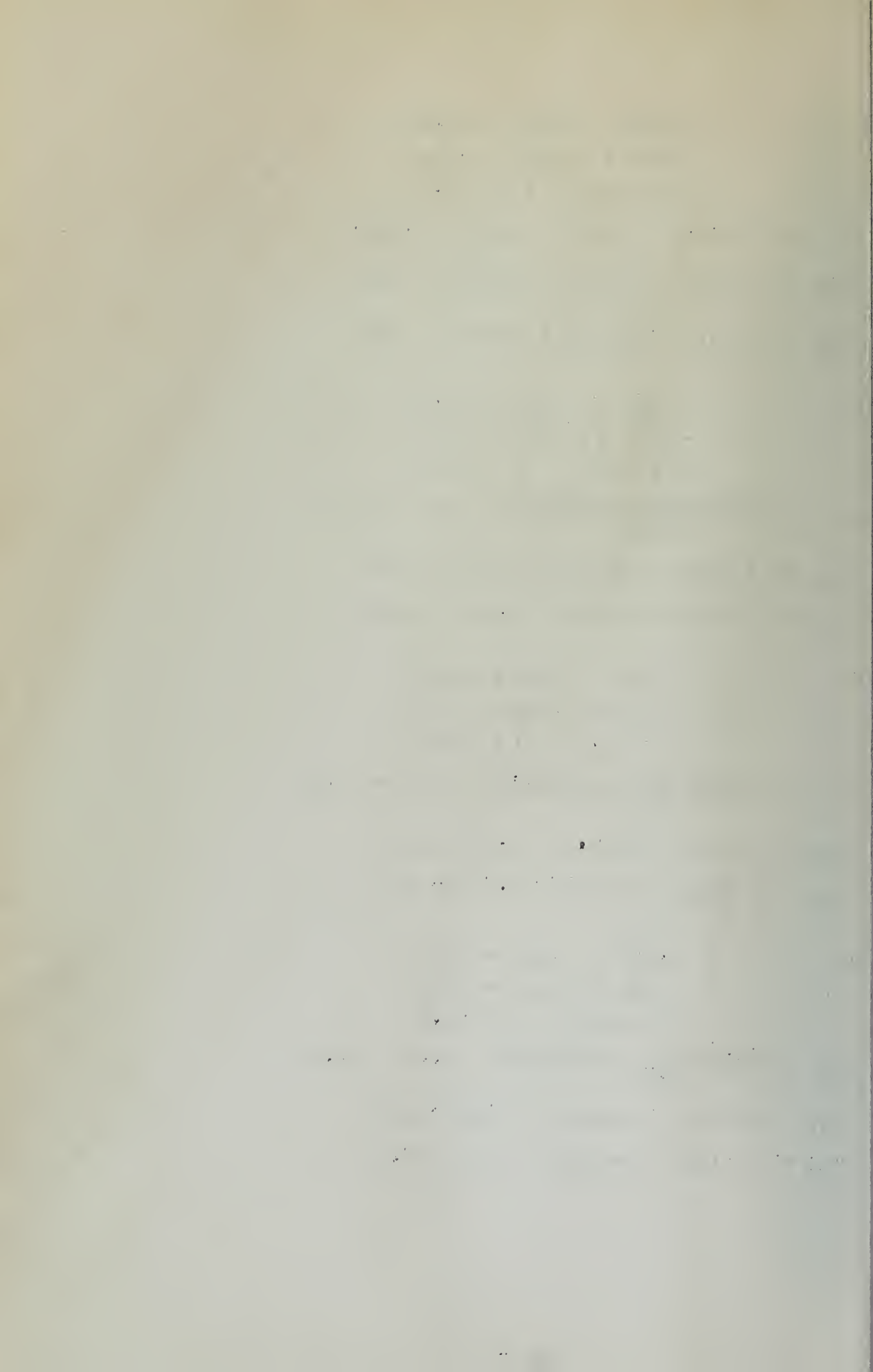
$$-.17H + 1.82I = -0.81$$

$$H = -0.59 \quad I = -0.50$$

$$R_8 = \frac{-2.83 \times .59 - 2.91 \times .50}{3.83} - 0.90 = -1.71$$

$$M_{HI} = 1(-0.59 - \frac{1}{2} \times 0.50 + 1.71) = 0.87$$

$$M_{IH} = 1(-0.50 - \frac{1}{2} \times 0.59 + 1.71) = 0.93$$



Joint Constant Computations - Load at C

Panel 1

$$1.82A - .17B = 4.89$$

$$-.26A + 1.76B = 5.38$$

$$A = 3.01 \quad B = 3.50$$

$$R_1 = \frac{2.91 \times 3.01 + 2.83 \times 3.50}{3.82} + 5.38 = 10.27$$

$$M_{AB} = (3.01 + \frac{3.50}{2} - 10.27) = -5.51$$

$$M_{BA} = (3.50 + \frac{3.01}{2} - 10.27) = -5.27$$

Panel 2

$$1.78B - .21C = 4.96$$

$$-.26B + 1.76C = 5.23$$

$$B = 3.20 \quad C = 3.44$$

$$R_2 = \frac{2.96 \times 3.20 + 2.91 \times 3.44}{3.92} + 5.23 = 10.21$$

$$M_{BC} = (3.20 + \frac{3.44}{2} - 10.21) = -5.29$$

$$M_{CB} = (3.44 + \frac{3.20}{2} - 10.21) = -5.17$$

Panel 3

$$1.78C - .21D = -2.36$$

$$-.26C + 1.76D = -2.38$$

$$C = -1.51 \quad D = -1.58$$

$$R_3 = \frac{-2.95 \times 1.51 - 2.90 \times 1.58}{3.90} - 2.38 = -4.70$$

$$M_{CD} = (-1.51 - \frac{1.58}{2} + 4.70) = 2.40$$

$$M_{DC} = (-1.58 - \frac{1.51}{2} + 4.70) = 2.37$$

Panel 4

$$1.75D - .25E = -1.87$$

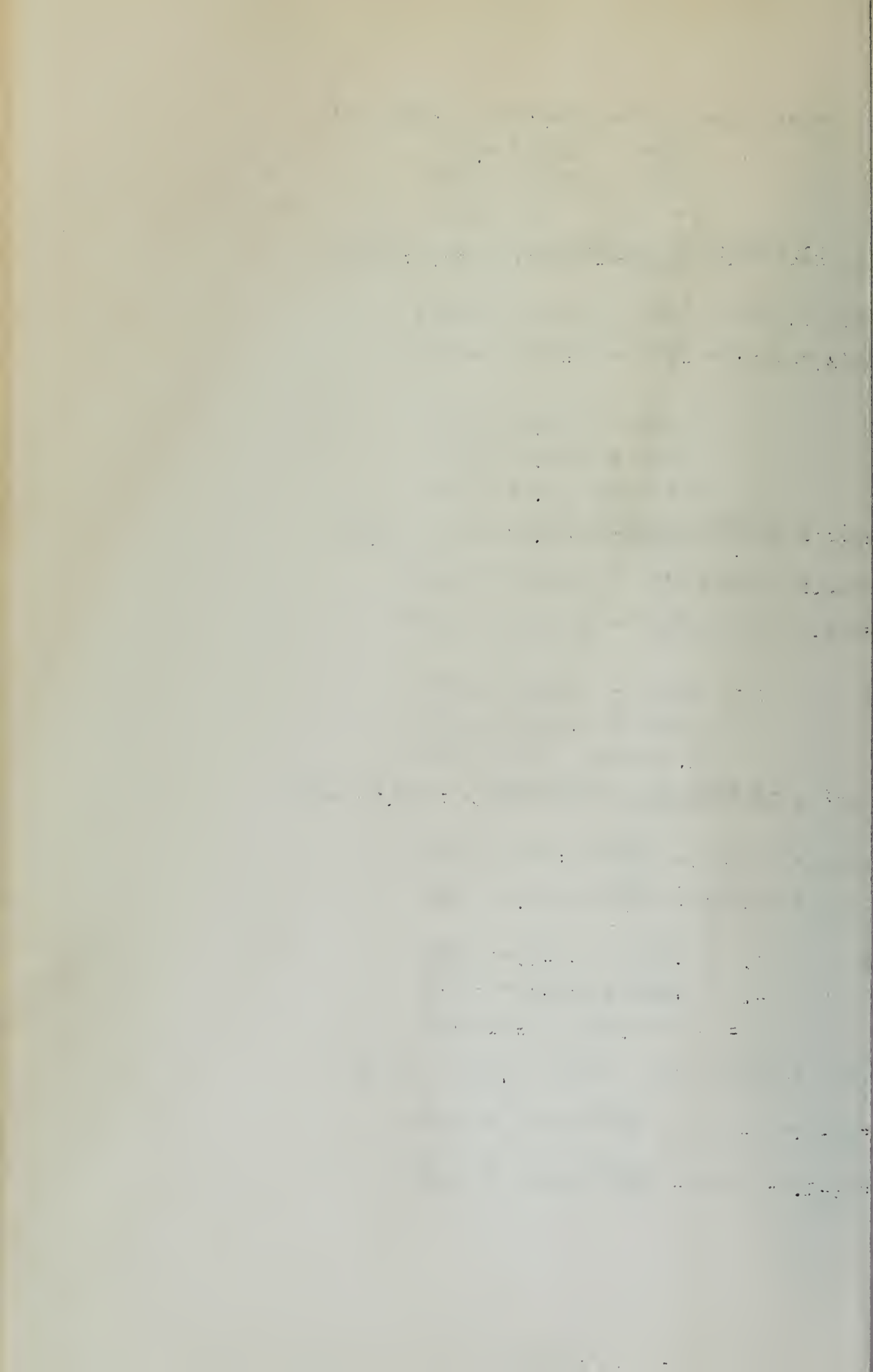
$$-.26D + 1.75E = -1.87$$

$$D = -1.25 \quad E = -1.25$$

$$R_4 = 3/4(-1.25 - 1.25) - 1.87 = -3.74$$

$$M_{DE} = (-1.25 - \frac{1.25}{2} + 3.74) = 1.87$$

$$M_{ED} = (-1.25 - \frac{1.25}{2} + 3.74) = 1.87$$



Panel 5

$$E = -1.26$$

$$F = -1.26$$

$$R_5 = -3.76$$

$$M_{EF} = 1.88$$

$$M_{FE} = 1.88$$

Panel 6

$$F = -1.08$$

$$G = -1.00$$

$$R_6 = -3.20$$

$$M_{FG} = 1.62$$

$$M_{GF} = 1.66$$

Panel 7

$$G = -1.14$$

$$H = -1.06$$

$$R_7 = -3.40$$

$$M_{GH} = 1.74$$

$$M_{HG} = 1.78$$

Panel 8

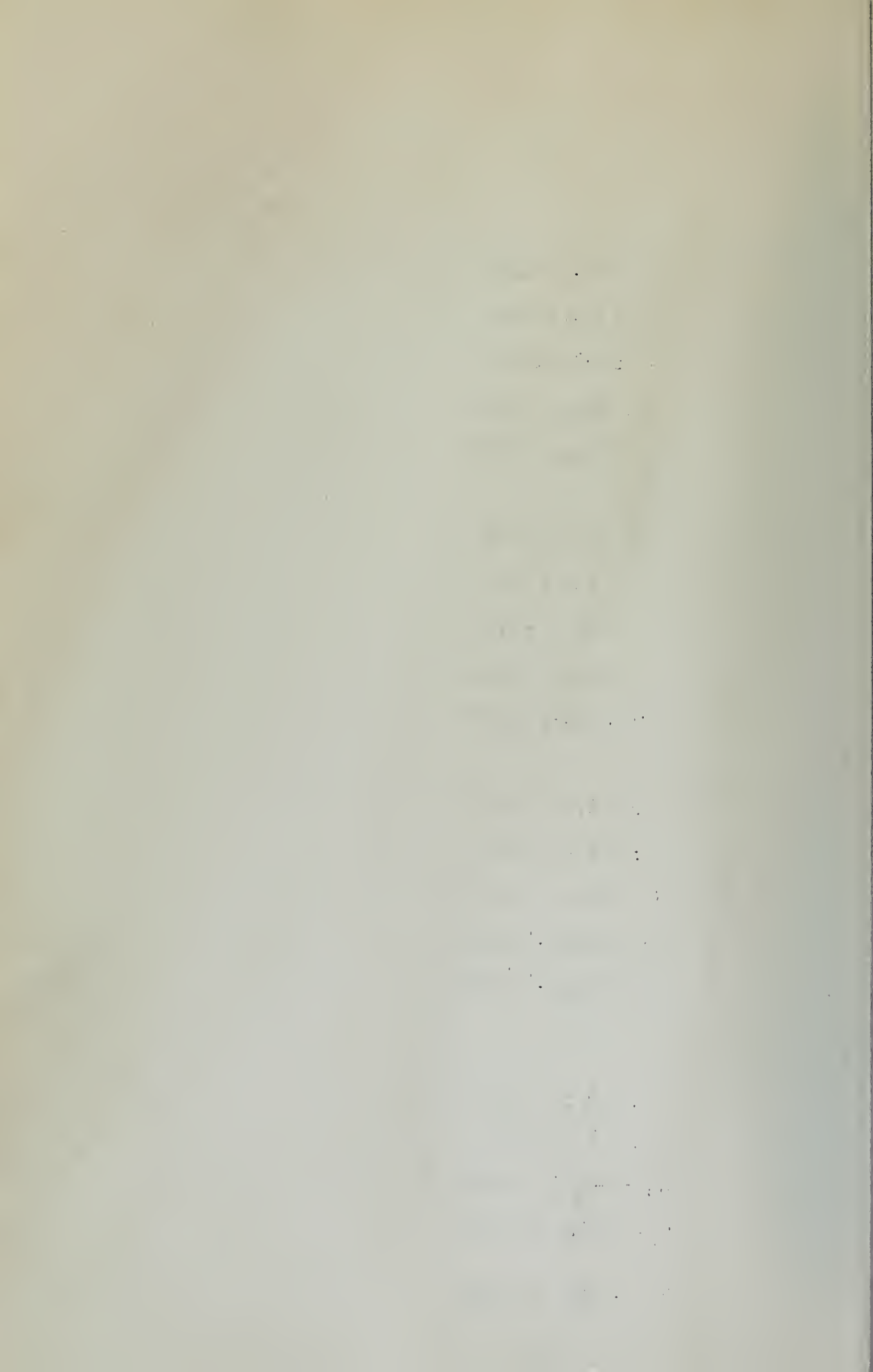
$$H = -1.18$$

$$I = -1.00$$

$$R_8 = -3.42$$

$$M_{HI} = 1.74$$

$$M_{IH} = 1.86$$



Joint Constant Computation-Load at D

Panel 1

$$\begin{aligned} 1.82A - .17B &= 4.12 \\ -.26A + 1.76B &= 4.49 \\ A &= 2.54 \quad B = 2.92 \end{aligned}$$

$$R_1 = \frac{2.91 \times 2.54 + 2.83 \times 2.92 + 4.49}{3.82} = 8.59$$

$$M_{AB} = (2.54 + \frac{2.92}{2} - 8.59) = -4.59$$

$$M_{BA} = (2.92 + \frac{2.54}{2} - 8.59) = -4.50$$

Panel 2

$$\begin{aligned} 1.78B - .21C &= 4.14 \\ -.26B + 1.76C &= 4.36 \end{aligned}$$

$$B = 2.67 \quad C = 2.87$$

$$R_2 = \frac{2.96 \times 2.67 + 2.91 \times 2.87 + 4.36}{3.92} = 8.51$$

$$M_{BC} = (2.67 + \frac{2.87}{2} - 8.51) = -4.41$$

$$M_{CB} = (2.87 + \frac{2.67}{2} - 8.51) = -4.31$$

Panel 3

$$\begin{aligned} 1.78C - .21D &= 3.91 \\ -.26C + 1.76D &= 4.12 \end{aligned}$$

$$C = 2.52 \quad D = 2.71$$

$$R_3 = \frac{2.95 \times 2.52 + 2.90 \times 2.71 + 4.12}{3.90} = 8.04$$

$$M_{CD} = (2.52 + \frac{2.71}{2} - 8.04) = -4.17$$

$$M_{DC} = (2.71 + \frac{2.52}{2} - 8.04) = 4.07$$

Panel 4

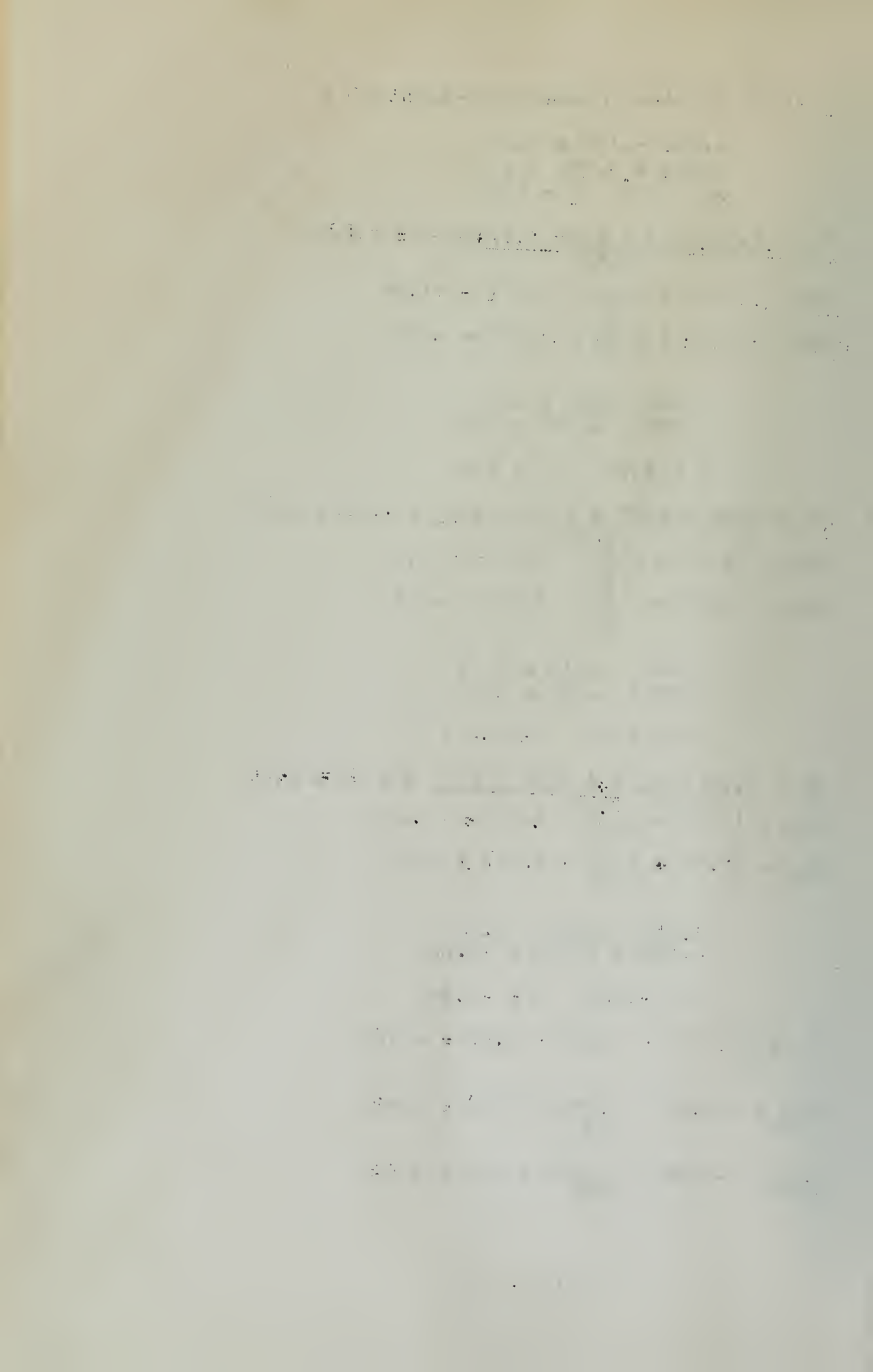
$$\begin{aligned} 1.75D - .25E &= -2.82 \\ -.25D + 1.75E &= -2.82 \end{aligned}$$

$$D = -1.88 \quad E = -1.88$$

$$R_4 = \frac{3(-1.88 - 1.88) - 2.82}{4} = -5.64$$

$$M_{DE} = (-1.88 - \frac{1.88}{2} + 5.64) = 2.82$$

$$M_{ED} = (-1.88 - \frac{1.88}{2} + 5.64) = 2.82$$



Panel 5

$$\begin{aligned}E &= -1.89 \\F &= -1.89 \\R_5 &= -5.64 \\M_{EF} &= 2.82 \\M_{FE} &= 2.82\end{aligned}$$

Panel 6

$$\begin{aligned}F &= -1.62 \\G &= -1.50 \\R_6 &= 4.80 \\M_{FG} &= 2.43 \\M_{GF} &= 2.49\end{aligned}$$

Panel 7

$$\begin{aligned}G &= -1.71 \\H &= -1.59 \\R_7 &= -5.10 \\M_{GH} &= 2.61 \\M_{HG} &= 2.67\end{aligned}$$

Panel 8

$$\begin{aligned}H &= -1.77 \\I &= -1.50 \\R_8 &= -5.13 \\M_{HI} &= 2.61 \\M_{IH} &= 2.79\end{aligned}$$

Joint Constant Computation - Load at E

Panel 1

$$1.82A - .17B = 3.26$$

$$.26A + 1.76B = 3.59$$

$$A = 2.01 \quad B = 2.34$$

$$R_1 = \frac{2.91 \times 2.01 + 2.83 \times 2.34}{3.82} + 3.59 = 6.86$$

$$M_{AB} = (2.01 + \frac{2.34}{2} - 6.86) = -3.68$$

$$M_{BA} = (2.34 + \frac{2.01}{2} - 6.86) = -3.52$$

Panel 2

$$1.78B - .21C = 3.31$$

$$.26B + 1.76C = 3.49$$

$$B = 2.13 \quad C = 2.30$$

$$R_2 = \frac{2.96 \times 2.13 + 2.91 \times 2.30}{3.92} + 3.49 = 6.81$$

$$M_{BC} = (2.13 + \frac{2.30}{2} - 6.81) = -3.53$$

$$M_{CB} = (2.30 + \frac{2.13}{2} - 6.81) = -3.45$$

Panel 3

$$1.78C - .21D = 3.13$$

$$.26C + 1.76D = 3.30$$

$$C = 2.01 \quad D = 2.17$$

$$R_3 = \frac{2.95 \times 2.01 + 2.90 \times 2.17}{3.90} + 3.30 = 6.44$$

$$M_{CD} = (2.01 + \frac{2.17}{2} - 6.44) = -3.35$$

$$M_{DC} = (2.17 + \frac{2.01}{2} - 6.44) = -3.27$$

Panel 4

$$1.75D - .25E = 3.75$$

$$.25D + 1.75E = 3.75$$

$$D = 2.50 \quad E = 2.50$$

$$R_4 = 3/4(2.50 + 2.50) + 3.75 = 7.50$$

$$M_{DE} = (2.50 + \frac{2.50}{2} - 7.50) = -3.75$$

$$M_{ED} = (2.50 + \frac{2.50}{2} - 7.50) = -3.75$$

Panel 5

$$E = -2.52$$

$$F = -2.52$$

$$R_5 = -7.52$$

$$M_{EF} = 3.76$$

$$M_{FE} = 3.76$$

Panel 6

$$E = -2.16$$

$$G = -2.00$$

$$E_5 = -6.40$$

$$M_{EG} = 3.24$$

$$M_{GE} = 3.24$$

Panel 7

$$G = -2.28$$

$$F = -2.12$$

$$E_5 = -6.80$$

$$M_{GH} = 3.48$$

$$M_{HG} = 3.56$$

Panel 8

$$H = -2.06$$

$$G = -2.00$$

$$E_5 = -6.80$$

$$M_{HI} = 3.48$$

$$M_{IH} = 3.72$$

Moment Corrections - Load at PPl

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = -1.22$$

$$A = -.07 \quad B = -.69$$

$$R_1 = \frac{-2.91 \times .07 - 2.83 \times .69}{3.83} = -.54$$

$$M_{AB} = 1(-.07 - \frac{1}{2} \times .69 + .54) = .12$$

$$M_{BA} = 1(-.69 - \frac{1}{2} \times .07 + .54) = -.18$$

Panel 2

$$1.78B - .20C = 6.16$$

$$-.26B + 1.76C = -1.21$$

$$B = 3.44 \quad C = -.18$$

$$R_2 = \frac{2.96 \times 3.44 - 2.91 \times .18}{3.91} = 2.47$$

$$M_{BC} = 1(3.44 - \frac{1}{2} \times .18 - 2.47) = .88$$

$$M_{CB} = 1(-.18 + \frac{1}{2} \times 3.44 - 2.47) = -.93$$

Panel 3

$$1.78C - .21D = -1.19$$

$$-.26C + 1.76D = -.94$$

$$C = -.74 \quad D = -.64$$

$$R_3 = \frac{-2.95 \times .74 - 2.90 \times .64}{3.90} = -1.04$$

$$M_{CD} = 1(-.74 - \frac{1}{2} \times .64 + 1.04) = -.02$$

$$M_{DC} = 1(-.64 - \frac{1}{2} \times .74 + 1.04) = .03$$

Panel 4

$$1.75D - .25E = -1.19$$

$$-.25D + 1.75E = -.94$$

$$D = -.77 \quad E = -.64$$

$$R_4 = 3/4(-.77 - .64) = -1.06$$

$$M_{DE} = 1(-.77 - \frac{1}{2} \times .64 + 1.06) = -.03$$

$$M_{ED} = 1(-.64 - \frac{1}{2} \times .77 + 1.06) = .03$$

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Panel 5

$$\begin{aligned} 1.75E - .25F &= -.94 \\ -.25E + 1.75F &= -.81 \end{aligned}$$

$$E = -.61$$

$$\begin{aligned} F &= -.54 \\ R_5 &= \frac{3}{4} (-.61 - .54) = -.86 \\ M_{EF} &= 1(-.61 - \frac{1}{2} \times .54 + .86) = -.02 \\ M_{FE} &= 1(-.54 - \frac{1}{2} \times .61 + .86) = .02 \end{aligned}$$

Panel 6

$$\begin{aligned} 1.76F - .26G &= -.94 \\ -.21F + 1.78G &= -.93 \end{aligned}$$

$$F = -.62$$

$$\begin{aligned} G &= -.56 \\ R_6 &= \frac{-2.90 \times .62 - 2.95 \times .56}{3.90} = -.88 \\ M_{FG} &= 1(-.62 - \frac{1}{2} \times .56 + .88) = 0 \\ M_{GF} &= 1(-.56 - \frac{1}{2} \times .62 + .88) = 0 \end{aligned}$$

Panel 7

$$\begin{aligned} 1.76G - .26H &= -.83 \\ -.20G + 1.78H &= -.87 \end{aligned}$$

$$G = -.55$$

$$H = -.55$$

$$\begin{aligned} R_7 &= \frac{-2.91 \times .55 - 2.96 \times .55}{3.91} = -.83 \\ M_{GH} &= 1(-.55 - \frac{1}{2} \times .55 + .83) = 0 \\ M_{HG} &= 1(-.55 - \frac{1}{2} \times .55 + .83) = 0 \end{aligned}$$

Panel 8

$$\begin{aligned} 1.76H - .26I &= -.89 \\ -.17H + 1.82I &= 0 \end{aligned}$$

$$H = -.51$$

$$I = -.05$$

$$\begin{aligned} R_8 &= \frac{-2.83 \times .51 - 2.91 \times .05}{3.83} = -.41 \\ M_{HI} &= 1(-.51 - \frac{1}{2} \times .05 + .42) = -.11 \\ M_{IH} &= 1(-.05 - \frac{1}{2} \times .51 + .42) = .11 \end{aligned}$$

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1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76 = -.88$$

$$A = -.04$$

$$B = -.49$$

$$R_1 = \frac{-2.91 \times .04 - 2.83 \times .49}{3.83} = -.40$$

$$M_{AB} = (.04 - \frac{1}{2} \times .49 + .40) = .11$$

$$M_{BA} = (.49 - \frac{1}{2} \times .04 + .40) = -.11$$

Panel 3

$$1.78C - .21D = .93$$

$$-.26C + 1.76D = .03$$

$$C = .59$$

$$D = .10$$

$$R_3 = \frac{2.95 \times .59 - 2.90 \times .10}{3.90} = .52$$

$$M_{CD} = 1(.59 + \frac{1}{2} \times .10 - .52) = .12$$

$$M_{DC} = 1(.10 + \frac{1}{2} \times .59 - .52) = -.12$$

Load at B

| nel | 1 | 2 | 3 | 4 | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | A | B | C | D | E | | | |
| Q | 5.77 | 6.28 | -1.15 | -1.21 | -1.13 | -1.19 | -.94 | -.94 |
| P | 3.56 | 4.09 | -.74 | -.80 | -.73 | -.78 | -.63 | -.63 |
| R | 2.03 | | -2.36 | | -2.33 | | -1.88 | |
| M' | -6.43 | -6.16 | 1.22 | 1.19 | 1.21 | 1.19 | 0.94 | 0.94 |
| Q | 0 | -1.22 | 6.16 | -1.21 | -1.19 | -.94 | -1.19 | -.94 |
| P | -.07 | -.69 | 3.44 | -.18 | -.74 | -.64 | -.77 | -.64 |
| R | -.54 | | 2.47 | | -1.04 | | -1.06 | |
| M'' | .12 | -.18 | .88 | -.93 | -.02 | .03 | -.03 | .03 |
| Q | 0 | -.88 | | | -.93 | .03 | | |
| P | -.04 | -.49 | | | .59 | .10 | | |
| R | -.40 | | | | .52 | | | |
| M''' | .11 | -.11 | 0 | 0 | .12 | -.12 | 0 | 0 |
| M'''' | -6.20 | -6.45 | 2.10 | .26 | 1.31 | 1.10 | .91 | .97 |

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry must be clearly documented, including the date, the amount, and the purpose of the transaction. This ensures that the financial data is reliable and can be used for future reference.

In the second section, the author outlines the various methods used to collect and analyze data. These methods include direct observation, interviews with key personnel, and the use of statistical tools to identify trends and patterns. The goal is to provide a comprehensive overview of the current state of affairs and to identify areas for improvement.

The third part of the document focuses on the implementation of new strategies and initiatives. It details the steps involved in planning, executing, and evaluating these efforts. The author stresses the need for clear communication and coordination among all stakeholders to ensure that the goals are met and that the organization remains on track.

Finally, the document concludes with a summary of the findings and recommendations. It highlights the key challenges faced by the organization and offers practical suggestions for addressing them. The author expresses confidence that the proposed changes will lead to a more efficient and successful operation.

| Inel | 5 | | 6 | | 7 | | 8 | |
|------|-------|------|-------|------|-------|------|-------|------|
| | E | F | F | G | G | H | H | I |
| Q | -.94 | -.94 | -.82 | -.78 | -.87 | -.83 | -.90 | -.81 |
| | -.63 | -.63 | -.54 | -.50 | -.57 | -.53 | -.59 | -.50 |
| R | -1.88 | | -1.60 | | -1.70 | | -1.71 | |
| M' | .94 | .94 | .81 | .83 | .87 | .89 | .87 | .93 |
| Q | -.94 | -.81 | -.94 | -.87 | -.83 | -.87 | -.89 | 0 |
| | -.61 | -.54 | -.62 | -.56 | -.55 | -.55 | -.51 | -.05 |
| R | -.86 | | -.88 | | -.83 | | -.41 | |
| M'' | -.02 | .02 | 0 | 0 | 0 | 0 | -.11 | .11 |
| Q | | | | | | | | |
| R | | | | | | | | |
| M''' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M | .92 | .96 | .81 | .83 | .87 | .89 | .76 | 1.04 |

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Moment Corrections Load at C

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 5.29$$

$$A = .29$$

$$B = 3.04$$

$$R_1 = \frac{2.91 \times .29 + 2.83 \times 3.04}{3.83} = 2.46$$

$$M_{AB} = 1(.29 + \frac{1}{2} \times 3.04 - 2.46) = -.65$$

$$M_{BC} = 1(3.04 + \frac{1}{2} \times .29 - 2.46) = .72$$

Panel 2

$$1.78B - .20C = 5.27$$

$$-.26B + 1.76 C = -2.40$$

$$B = 2.85$$

$$C = -.94$$

$$R_2 = \frac{2.96 \times 2.85 - 2.91 \times .94}{3.91} = 1.46$$

$$M_{BC} = 1(2.85 - \frac{1}{2} \times .94 - 1.46) = .92$$

$$M_{CB} = 1(-.94 + \frac{1}{2} \times 2.85 - 1.46) = -.98$$

Panel 3

$$1.78C - .21D = 5.17$$

$$-.26C + 1.76D = -1.87$$

$$C = 2.82$$

$$D = -.65$$

$$R_3 = \frac{2.95 \times 2.82 - 2.90 \times .65}{3.90} = 1.65$$

$$M_{CD} = 1(2.82 - \frac{1}{2} \times .65 - 1.65) = .85$$

$$M_{DC} = 1(-.65 + \frac{1}{2} \times 2.82 - 1.65) = -.89$$

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$$1.75D - .25E = -2.37$$

$$-.25D + 1.75E = -1.88$$

$$D = -1.54$$

$$E = -1.30$$

$$R_4 = \frac{3}{4} (-1.54 - 1.30) = -2.13$$

$$M_{DE} = 1(-1.54 - \frac{1}{2} \times 1.30 + 2.13) = -.06$$

$$M_{ED} = 1(-1.30 - \frac{1}{2} \times 1.54 + 2.13) = .06$$

anel 5

$$1.75 - .25F = -1.87$$

$$-.25E + 1.75F = -1.62$$

$$E = -1.23$$

$$F = -1.10$$

$$R_5 = \frac{3}{4} (-1.23 - 1.10) = -1.75$$

$$M_{EF} = 1(-1.23 - \frac{1}{2} \times 1.10 + 1.75) = -.03$$

$$M_{FE} = 1(-1.10 - \frac{1}{2} \times 1.23 + 1.75) = .03$$

anel 6

$$1.76F - .26G = -1.88$$

$$-.21F + 1.78G = -1.74$$

$$F = -1.22$$

$$G = -1.12$$

$$R_6 = \frac{-2.90 \times 1.22 - 2.95 \times 1.12}{3.90} = -1.75$$

$$M_{FG} = 1(-1.22 - \frac{1}{2} \times 1.12 + 1.75) = -.03$$

$$M_{GF} = 1(-1.12 - \frac{1}{2} \times 1.22 + 1.75) = .02$$

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Panel 7

$$1.76G - .26H = -1.66$$

$$-.20G + 1.78H = -1.74$$

$$G = -1.10$$

$$H = -1.10$$

$$R_7 = \frac{-2.91 \times 1.10 - 2.96 \times 1.10}{3.91} = -1.65$$

$$M_{GH} = 1(-1.10 - \frac{1}{2} \times 1.10 + 1.65) = 0$$

$$M_{HG} = 1(-1.10 - \frac{1}{2} \times 1.10 + 1.65) = 0$$

Panel 8

$$1.76H - .26I = -1.78$$

$$-.17H + 1.82I = 0$$

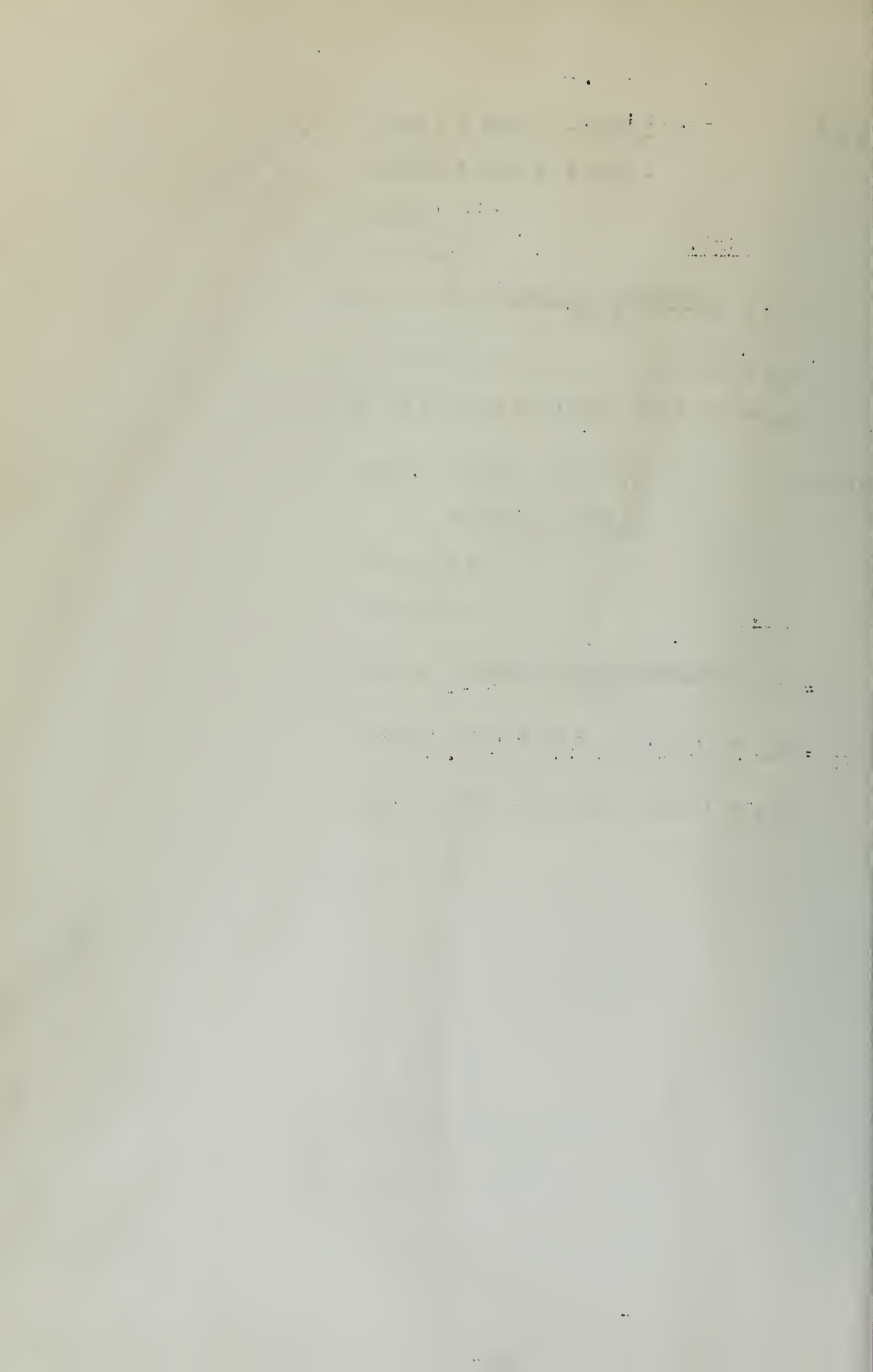
$$H = -1.02$$

$$I = -0.10$$

$$R_8 = \frac{-2.83 \times 1.02 - 2.91 \times .10}{3.83} = -.83$$

$$M_{HI} = 1(-1.02 - \frac{1}{2} \times .10 + .83) = -.24$$

$$M_{IH} = 1(-.10 - \frac{1}{2} \times 1.02 + .83) = .22$$



$$\begin{aligned}\text{Panel 1} \quad & 1.82A - .17B = 0 \\ & -.26A + 1.76B = -.92 \\ & A = -.05 \quad B = -.53\end{aligned}$$

$$R_1 = \frac{-2.91 \times .05 - 2.83 \times .53}{3.83} = -.43$$

$$M_{AB} = 1(-.05 - \frac{1}{2} \times .53 + .43) = .11$$

$$M_{BA} = 1(-.53 - \frac{1}{2} \times .05 + .43) = -.11$$

$$\begin{aligned}\text{Panel 2} \quad & 1.78B + .20C = .72 \\ & -.26B + 1.76C = -.85 \\ & B = -.46 \quad C = -.55\end{aligned}$$

$$R_2 = \frac{-2.96 \times .46 - 2.91 \times .55}{3.91} = -.76$$

$$M_{BC} = 1(-.46 - \frac{1}{2} \times .55 + .76) = .02$$

$$M_{CB} = 1(-.55 - \frac{1}{2} \times .46 + .76) = -.02$$

$$\begin{aligned}\text{Panel 3} \quad & 1.78C - .21D = .98 \\ & -.26C + 1.76D = .06 \\ & C = .56 \quad D = .12\end{aligned}$$

$$R_3 = \frac{2.95 \times .56 + 2.90 \times .12}{3.90} = .57$$

$$M_{CD} = 1(.56 + \frac{1}{2} \times .12 - .51) = .11$$

$$M_{DC} = 1(.12 + \frac{1}{2} \times .56 - .51) = -.11$$

$$\begin{aligned}\text{Panel 4} \quad & 1.75D - .25E = .89 \\ & -.25D + 1.75E = .03 \\ & D = .52 \quad E = .09\end{aligned}$$

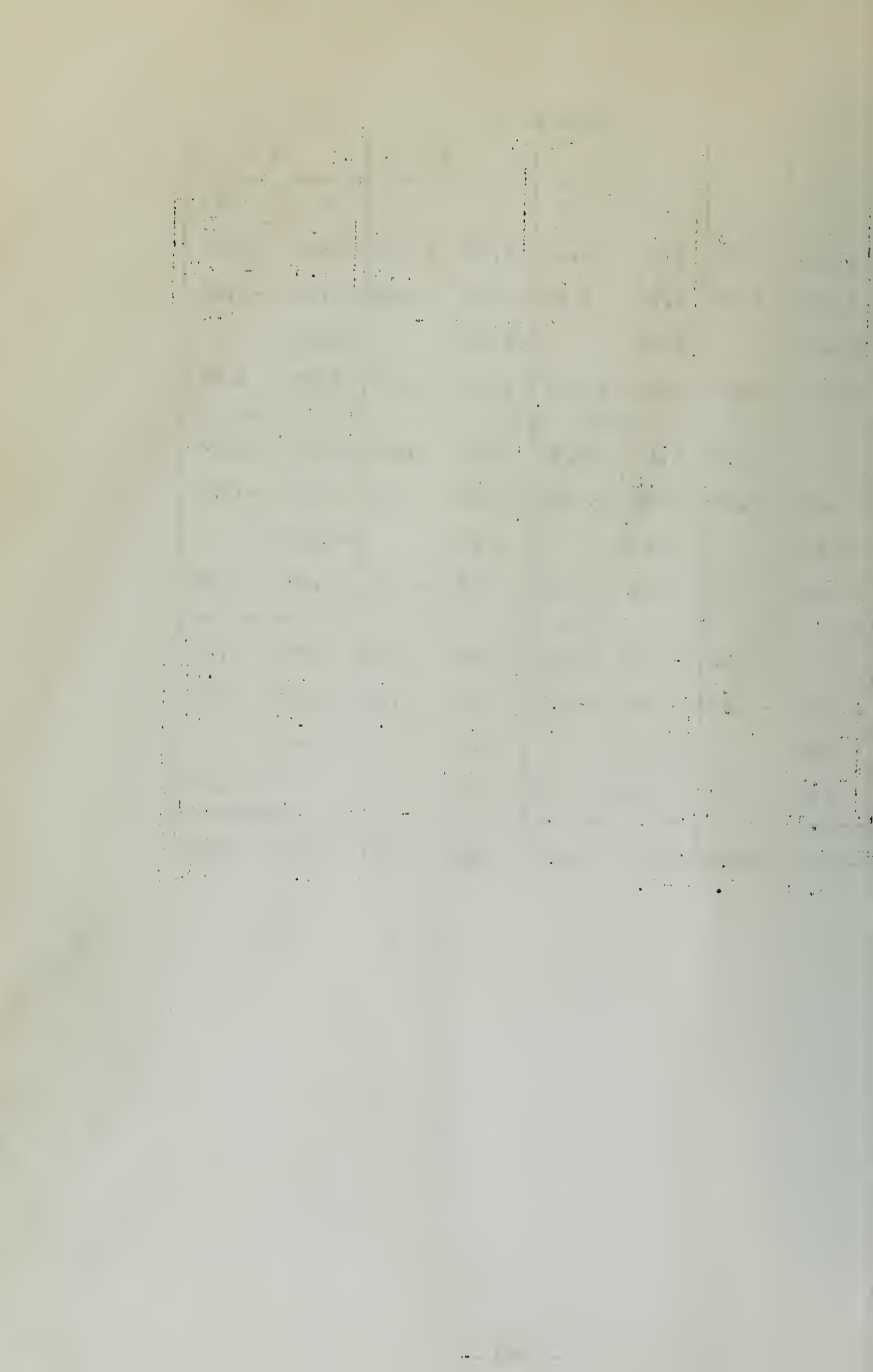
$$R_4 = 3/4(.52 + .09) = .46$$

$$M_{DE} = 1(.52 + \frac{1}{2} \times .09 - .46) = .11$$

$$M_{ED} = 1(.09 + \frac{1}{2} \times .52 - .46) = -.11$$

Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 4.89 | 5.38 | 4.96 | 5.23 | -2.36 | -2.38 | -1.87 | -1.87 |
| x | 3.01 | 3.50 | 3.20 | 3.44 | -1.51 | -1.58 | -1.25 | -1.25 |
| R | 10.27 | | 10.21 | | -4.70 | | -3.74 | |
| M' | -5.41 | -5.27 | -5.29 | -5.17 | 2.40 | 2.37 | 1.87 | 1.87 |
| Q | 0 | 5.29 | 5.27 | -2.40 | 5.17 | -1.87 | -2.37 | -1.88 |
| x | .29 | 3.04 | 2.85 | -.94 | 2.82 | -.65 | -1.54 | -1.30 |
| R | 2.46 | | 1.46 | | 1.65 | | -2.13 | |
| M' | -.65 | .72 | .92 | -.98 | .85 | -.89 | -.06 | .06 |
| Q | 0 | -.92 | -.72 | -.85 | .98 | .06 | .89 | .03 |
| x | -.05 | -.53 | -.46 | -.55 | .56 | .12 | .52 | .09 |
| R | -.43 | | -.76 | | .51 | | .46 | |
| M'' | .11 | -.11 | .02 | -.02 | .11 | -.11 | .11 | -.11 |
| M | -6.05 | -4.65 | -4.35 | -6.17 | 3.36 | 1.37 | 1.92 | 1.82 |



| 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| L | F | F | G | G | H | H | I |
| -1.88 | -1.88 | -1.64 | -1.56 | -1.74 | -1.66 | -1.80 | -1.62 |
| -1.26 | -1.26 | -1.08 | -1.00 | -1.14 | -1.06 | -1.18 | -1.10 |
| -3.76 | | -3.20 | | -3.40 | | -3.42 | |
| 1.88 | 1.88 | 1.62 | 1.66 | 1.74 | 1.78 | 1.74 | 1.86 |
| -1.87 | -1.62 | -1.88 | -1.74 | -1.66 | -1.74 | -1.78 | 0 |
| -1.23 | -1.10 | -1.22 | -1.12 | -1.10 | -1.10 | -1.02 | - .10 |
| -1.75 | | -1.75 | | -1.65 | | - .83 | |
| - .03 | .03 | - .03 | .02 | 0 | 0 | - .24 | .22 |
| - .06 | .03 | - .03 | 0 | - .02 | .24 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.85 | 1.91 | 1.59 | 1.68 | 1.74 | 1.78 | 1.50 | 2.08 |

Influence Line Corrections - First Set

Panel 1

Load at D

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 4.41$$

$$A = .24$$

$$B = 2.54$$

$$R_1 = 2.06$$

$$M_{AB} = (.24 + \frac{2.54}{2} - 2.06) = -.57$$

$$M_{BA} = (2.54 + \frac{.24}{2} - 2.06) = -.59$$

Panel 2

$$1.78B - .21C = 4.40$$

$$-.26B + 1.76C = 4.17$$

$$B = 2.80$$

$$C = 2.78$$

$$R_2 = 4.18$$

$$M_{BC} = (2.80 + \frac{2.78}{2} - 4.18) = 0$$

$$M_{CB} = (2.78 + \frac{2.80}{2} - 4.18) = 0$$

Panel 3

$$1.78C - .21D = 4.31$$

$$-.26C + 1.76D = -2.82$$

$$C = 2.27$$

$$D = -1.27$$

$$R_3 = .78$$

$$M_{CD} = (2.27 - \frac{1.27}{2} - .78) = .86$$

$$M_{DC} = (-1.27 + \frac{2.27}{2} - .78) = -.92$$

Panel 4

$$1.75D - .25E = 4.07$$

$$-.25D + 1.75E = -2.82$$

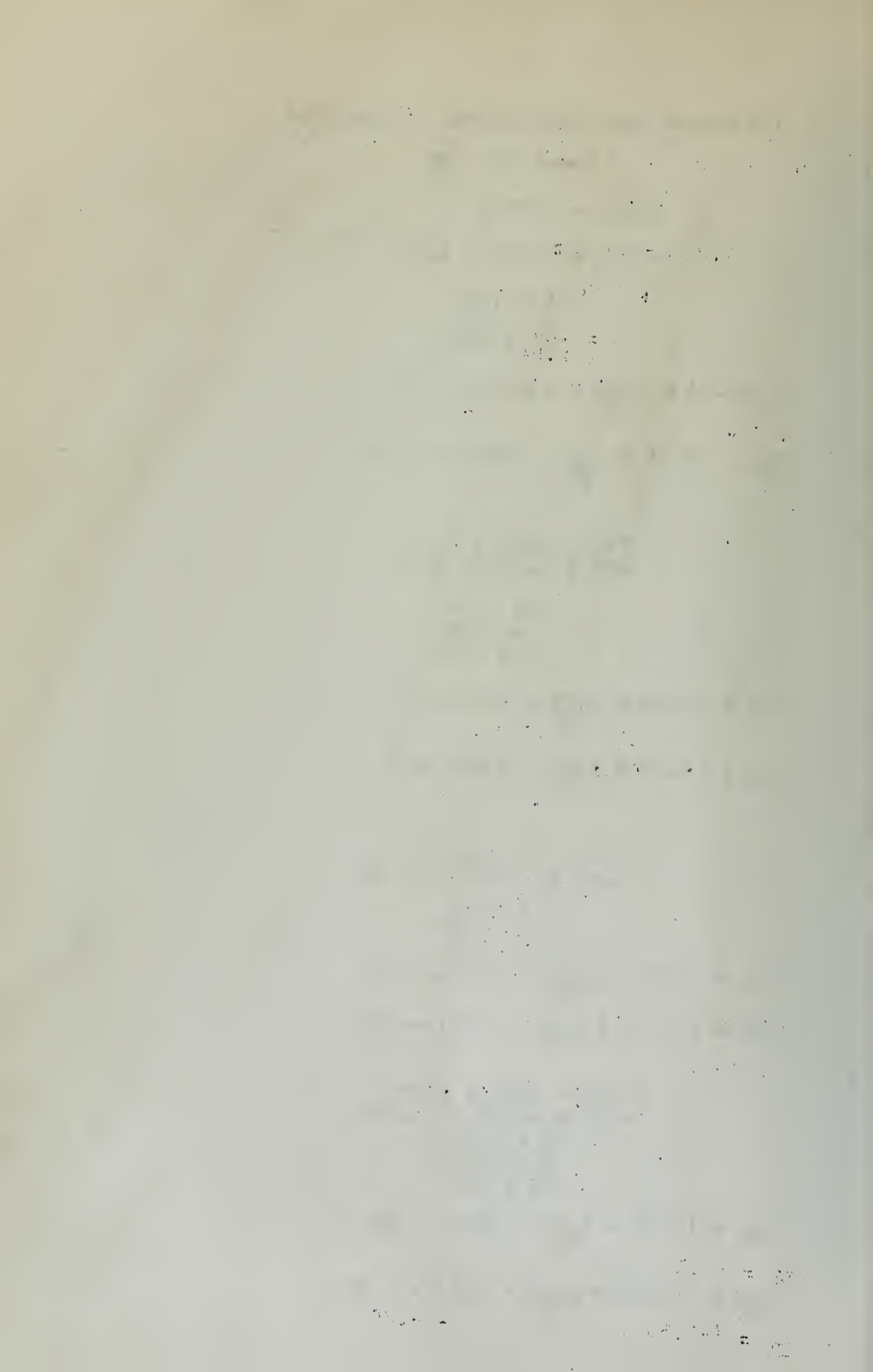
$$D = 2.14$$

$$E = -1.30$$

$$R_4 = .63$$

$$M_{DE} = (2.14 - \frac{1.30}{2} - .63) = .86$$

$$M_{ED} = (-1.30 + \frac{2.14}{2} - .63) = -.86$$



anel 5

$$\begin{aligned}-.25F + 1.75E &= -2.82 \\ 1.75F - .25E &= -2.43\end{aligned}$$

$$\begin{aligned}E &= -1.85 \\ F &= -1.65 \\ R_5 &= -2.63\end{aligned}$$

$$M_{EF} = (-1.85 - \frac{1.65}{2} + 2.63) = -.04$$

$$M_{FE} = (-1.65 - 1.85 + 2.63) = .06$$

anel 6

$$\begin{aligned}-.26G + 1.76F &= -2.82 \\ 1.78G - .21F &= -2.61\end{aligned}$$

$$\begin{aligned}F &= -1.85 \\ G &= -1.69 \\ R_6 &= -2.66\end{aligned}$$

$$M_{FG} = (-1.85 - \frac{1.69}{2} + 2.66) = -.03$$

$$M_{GF} = (-1.69 - \frac{1.85}{2} + 2.66) = .05$$

anel 7

$$\begin{aligned}-.26H + 1.76G &= -2.49 \\ 1.78H - .21G &= -2.61\end{aligned}$$

$$\begin{aligned}G &= -1.66 \\ H &= -1.66 \\ R_7 &= -2.49\end{aligned}$$

$$M_{GH} = (-1.66 - \frac{1.66}{2} + 2.49) = 0$$

$$M_{HG} = (-1.66 - \frac{1.66}{2} + 2.49) = 0$$

anel 8

$$\begin{aligned}-.26I + 1.76H &= -2.67 \\ 1.82I - .17H &= 0\end{aligned}$$

$$\begin{aligned}H &= -1.54 \\ I &= -.14 \\ R_8 &= -1.25\end{aligned}$$

$$M_{HI} = (-1.54 - \frac{.14}{2} + 1.25) = -.36$$

$$M_{IH} = (-.14 - \frac{1.54}{2} + 1.25) = .34$$

Influence Line Corrections-Load at D

Second Set

nel 1

0

nel 2

$$1.78B - .21C = .59$$

$$-.26B + 1.76C = -.86$$

$$B = -.40$$

$$C = -.55$$

$$R_2 = -.71$$

$$M_{BC} = (-.40 - \frac{.55}{2} + .71) = .04$$

$$M_{CB} = (-.55 - \frac{.40}{2} + .71) = -.04$$

nel 3

$$1.78C - .21D = 0$$

$$-.26C + 1.76D = -.86$$

$$C = -.06$$

$$D = -.50$$

$$R_3 = -.42$$

$$M_{CD} = (-.06 - \frac{.50}{2} + .42) = .11$$

$$M_{DC} = (-.50 - \frac{.06}{2} + .42) = -.11$$

nel 4

$$1.75D - .25E = .92$$

$$-.25D + 1.75E = .04$$

$$D = .54$$

$$E = .10$$

$$R_4 = .43$$

$$M_{DE} = (.54 + \frac{.10}{2} - .43) = .11$$

$$M_{ED} = (.10 + .54 - .43) = .11$$

Panel 5

$$-.25F + 1.75E = .86$$

$$1.75F - .25E = .03$$

$$E = .50$$

$$F = .09$$

$$R_5 = .44$$

$$M_{EF} = (.50 + \frac{.09}{2} - .44) = .10$$

$$M_{FE} = (.09 + \frac{.50}{2} - .44) = -.10$$

Panel 6

$$-.26G + 1.76F = -.06$$

$$1.78G - .21F = 0$$

$$F = -.35 \quad G = 0$$

$$M_{FG} = (-.35 - 0 + .26) = -.09$$

$$M_{GF} = (0 - .35 + .26) = .09$$

Panel 7

$$-.26H + 1.76G = -.03$$

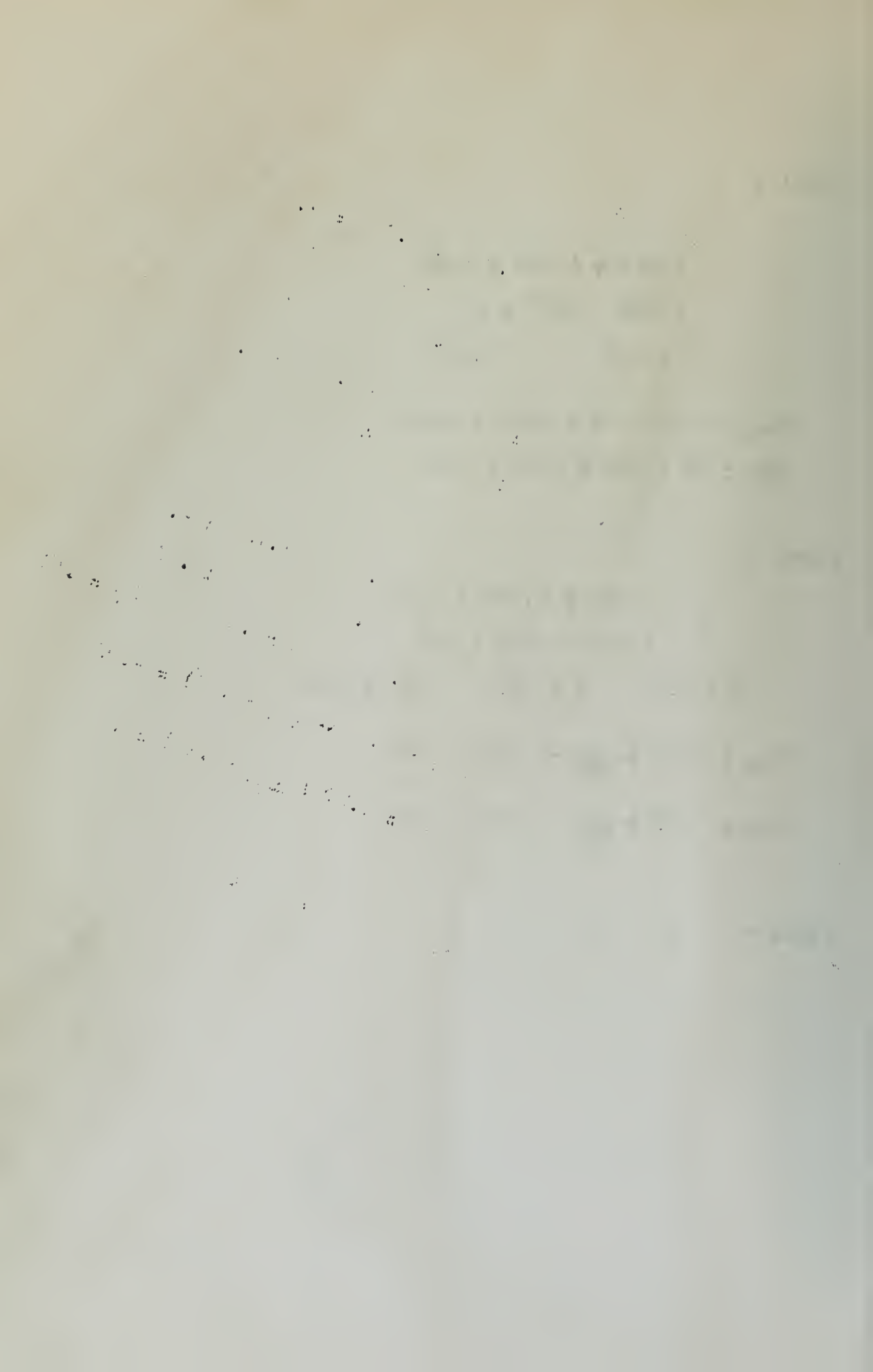
$$1.78H - .21G = .36$$

$$G = .01 \quad H = .20 \quad R_7 = .16$$

$$M_{GH} = (.01 + \frac{.20}{2} - .16) = -.05$$

$$M_{HG} = (.20 + \frac{.01}{2} - .16) = .04$$

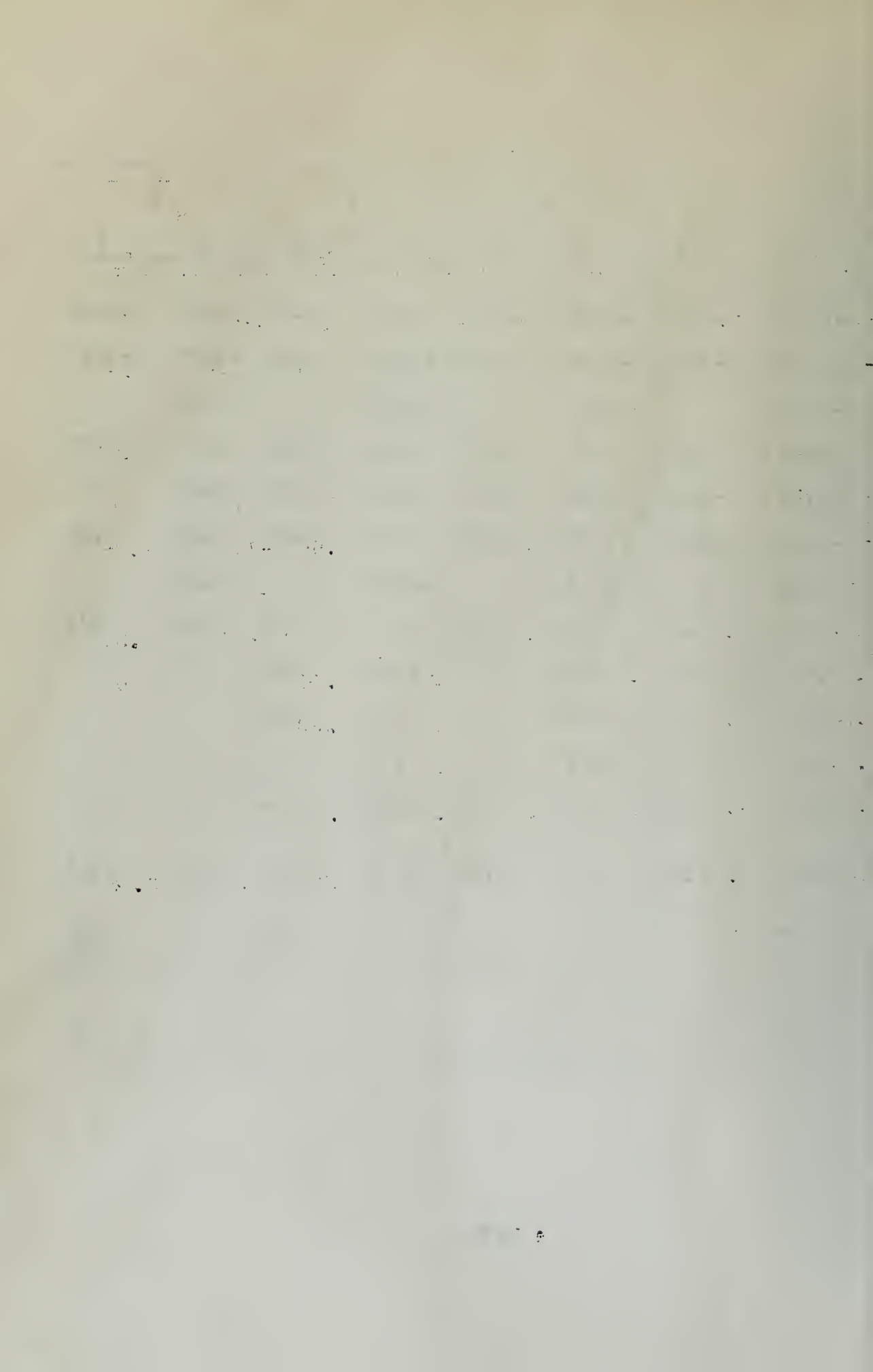
Panel 8 = 0



LOAD AT D

| Panel
Point | 1 | | 2 | | 3 | | 4 | |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| -Q | 4.12 | 4.49 | 4.14 | 4.36 | 3.91 | 4.12 | 2.82 | -2.82 |
| | 2.54 | 2.92 | 2.67 | 2.87 | 2.52 | 2.71 | -1.88 | -1.88 |
| R | 8.59 | | 8.51 | | 8.04 | | -5.64 | |
| M' | -4.59 | -4.40 | -4.41 | -4.31 | -4.17 | -4.07 | 2.82 | 2.82 |
| -Q | 0 | 4.41 | 4.40 | 4.17 | 4.31 | -2.82 | 4.07 | -2.82 |
| | .24 | 2.54 | 2.80 | 2.78 | 2.27 | -1.27 | 2.14 | -1.30 |
| R | 2.06 | | 4.18 | | .78 | | .63 | |
| M'' | -.57 | .59 | 0 | 0 | .86 | -.92 | .86 | -.86 |
| -Q | 0 | 0 | -.59 | -.86 | 0 | -.86 | .92 | .04 |
| | | | -.40 | -.55 | -.06 | -.50 | .54 | .10 |
| R | | | -.71 | | -.42 | | .48 | |
| M'' | 0 | 0 | .04 | -.04 | .11 | -.11 | .11 | -.11 |
| M | -5.16 | -3.81 | -4.37 | -4.35 | -3.20 | -5.10 | 3.79 | 1.85 |

| Panel | 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point | E | F | F | G | G | H | H | I |
| -Q | -2.82 | -2.82 | -2.46 | -2.34 | -2.61 | -2.49 | -2.70 | -2.43 |
| Q | -1.89 | -1.82 | -1.62 | -1.50 | -1.71 | -1.59 | -1.77 | -1.50 |
| R | -5.34 | | -4.80 | | -5.10 | | -5.13 | |
| M' | 2.82 | 2.82 | 2.43 | 2.49 | 2.61 | 2.67 | 2.61 | 2.79 |
| -Q | -2.82 | -2.43 | -2.32 | -2.61 | -2.49 | -2.61 | -2.67 | 0 |
| Q | -1.85 | -1.65 | -1.69 | -1.85 | -1.66 | -1.66 | -1.54 | -.14 |
| R | -2.63 | | -2.56 | | -2.49 | | -1.25 | |
| M'' | -.04 | .06 | -.03 | .05 | 0 | 0 | -.36 | .34 |
| -Q | .86 | .05 | -.06 | 0 | -.03 | .36 | 0 | 0 |
| Q | .50 | .09 | -.35 | 0 | .01 | .20 | | |
| R | .44 | | -.26 | | .15 | | | |
| M'' | .10 | -.10 | -.09 | .09 | -.05 | .04 | 0 | 0 |
| Σ M | 2.88 | 2.78 | 2.33 | 2.61 | 2.53 | 2.71 | 2.25 | 3.13 |



Influence Line Corrections-Load at E
First Set

Panels 1,8

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 3.53$$

$$A = -.19 \quad B = 2.03 \quad R_1 = 1.65$$

$$M_{AB} = (.19 + \frac{2.03}{2} - 1.65) = -.45$$

$$M_{BA} = (2.03 + \frac{.19}{2} - 1.65) = .47$$

Panels 2,7

$$1.78B - .21C = 3.48$$

$$-.26B + 1.76C = 3.24$$

$$B = 2.21 \quad C = 2.17 \quad R_2 = 3.28$$

$$M_{BC} = (2.21 + \frac{2.17}{2} - 3.28) = .01$$

$$M_{CB} = (2.17 + \frac{2.21}{2} - 3.28) = -.01$$

Panels 3,6

$$1.78C - .21D = 3.45$$

$$-.26C + 1.76D = 3.76$$

$$C = 2.23 \quad D = 2.46 \quad R_3 = 3.52$$

$$M_{CD} = (2.23 + \frac{2.46}{2} - 3.52) = -.06$$

$$M_{DC} = (2.46 + \frac{2.23}{2} - 3.52) = .05$$

Panels 4,5

$$1.75D - .25E = 3.24$$

$$-.25D + 1.75E = -3.76$$

$$D = 1.58 \quad E = -1.92 \quad R_4 = -.25$$

$$M_{DE} = (1.58 + \frac{1.92}{2} + .25) = .87$$

$$M_{ED} = (-1.92 + \frac{1.58}{2} + .25) = -.88$$

Influence Line Corrections-Load at E Second Set

panels 1,8

0

panels 2,7

$$1.78B - .21C = -.47$$

$$-.26B + 1.76C = .06$$

$$B = -.26 \quad C = -.01 \quad R_2 = -.20$$

$$M_{BC} = (.01 - \frac{.26}{2} + .20) = .06$$

$$M_{CB} = (-.01 - .26 + 2.0) = .06$$

panels 3,6

$$1.75C - .21D = .01$$

$$-.26C + 1.76D = -.87$$

$$C = -.05 \quad D = -.50 \quad R_3 = -.41$$

$$M_{CD} = (.05 - \frac{.50}{2} + .41) = .11$$

$$M_{DC} = (-.50 - \frac{.05}{2} + .41) = -.11$$

panels 4,5

$$1.75D - .25E = -.05$$

$$-.25D + 1.75E = -.88$$

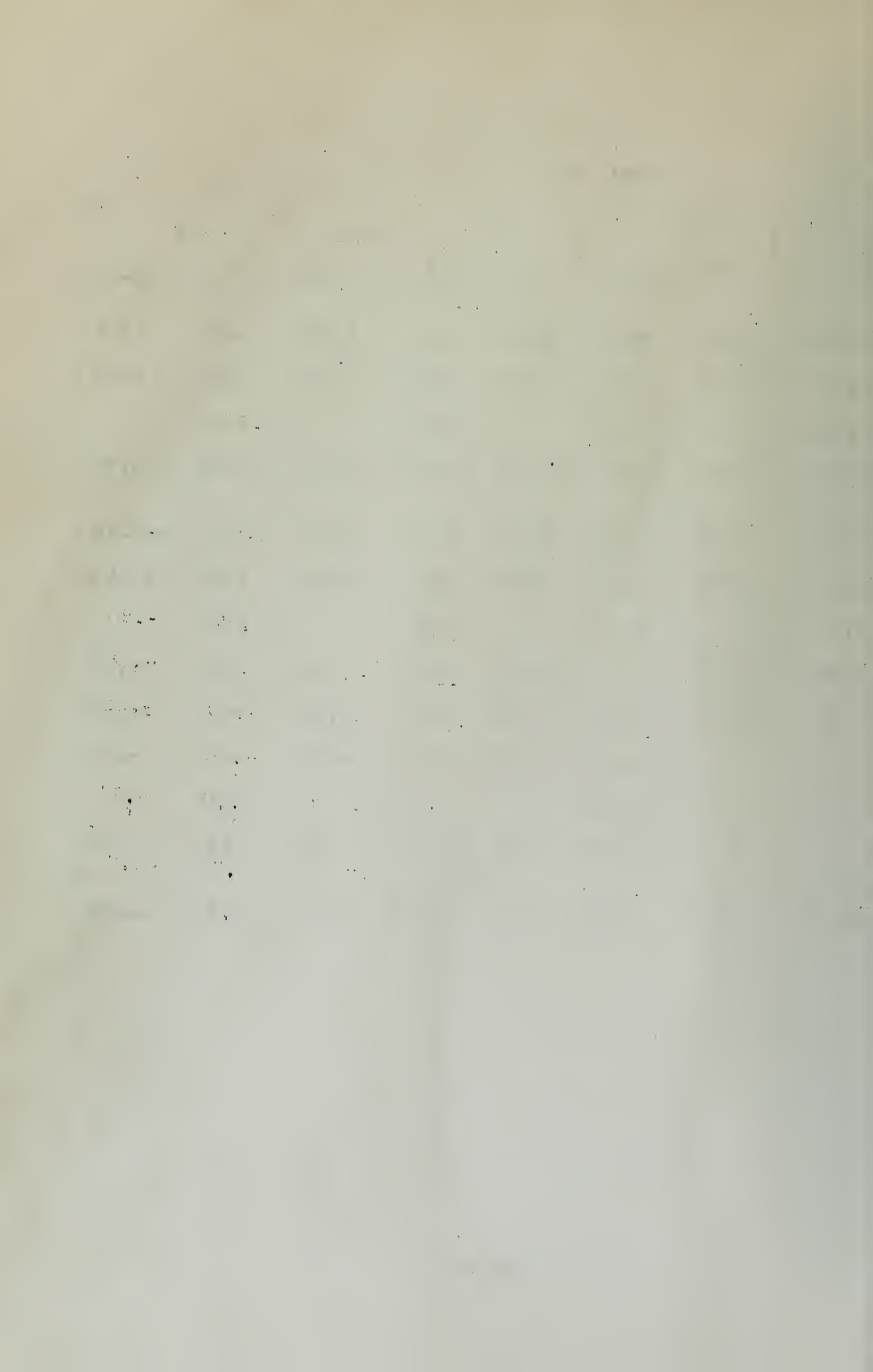
$$D = -.10 \quad E = -.52 \quad R_4 = -.46$$

$$M_{DE} = (-.10 - \frac{.52}{2} + .46) = .10$$

$$M_{ED} = (-.52 - \frac{.10}{2} + .46) = -.11$$

Load at E

| Inel
Point | 1 | | 2 | | 3 | | 4 | |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| | 3.24 | 3.60 | 3.32 | 3.48 | 3.12 | 3.28 | 3.76 | 3.76 |
| | 2.00 | -2.36 | 2.12 | 2.28 | 2.00 | 2.16 | 2.52 | 2.52 |
| | 6.84 | | 6.81 | | 6.40 | | 7.52 | |
| | -3.72 | -3.48 | -3.53 | -3.45 | -3.24 | -3.24 | -3.76 | -3.76 |
| | 0 | 3.53 | 3.48 | 3.24 | 3.45 | 3.76 | 3.24 | -3.76 |
| | .19 | 2.03 | 2.31 | 2.17 | 2.23 | 2.46 | 1.58 | -1.92 |
| | 1.65 | | 3.28 | | 3.52 | | -.25 | |
| | -.45 | .47 | .01 | -.01 | -.06 | .05 | .87 | -.88 |
| | 0 | -.01 | -.47 | .06 | .01 | -.87 | -.05 | -.88 |
| | | | -.26 | -.01 | -.05 | -.50 | -.10 | -.52 |
| | | | -.20 | | -.41 | | -.46 | |
| | | | -.06 | .06 | .11 | -.11 | .10 | -.11 |
| | -4.17 | -3.01 | -3.58 | -3.40 | -3.19 | -3.30 | -2.79 | -4.75 |



Moment Computations

Member AA' DL = 3422 fk
 LL E-60 = 3005
 Impact = 643
 Total 7070

LL H15-S12-44 = 401
 Conc. = 91
 Impact = 68
 Total 560

Sidewalk = 259

Design Moment = 7,869 fk

Member BB' DL = 4680 fk
 LL E-60 = 3990
 Impact = 835
 Total 9505

LL H15-S12-44 = 548
 Conc. = 128
 Impact = 93
 Total 769

Sidewalk = 326

Design Moment = 10,600 fk

Member CC' DL = 3230 fk
 LL E-60 = 2945
 Impact = 728
 Total 6903

LL H15-S12-44 = 384
 Conc. = 115
 Impact = 82
 Total 581

Sidewalk = 247

Design Moment = 7,781 fk

| nel
Int | 5 | | 6 | | 7 | | 8 | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | E | F | F | G | G | H | H | I |
| -Q | -3.76 | -3.76 | -3.28 | -3.12 | -3.48 | -3.32 | -3.60 | -3.24 |
| C | -2.52 | -2.52 | -2.16 | -2.00 | -2.28 | -2.12 | -2.36 | -2.00 |
| R | -7.52 | | -6.40 | | -6.81 | | -6.84 | |
| M' | 3.76 | 3.76 | 3.24 | 3.24 | 3.45 | 3.53 | 3.48 | 3.72 |
| -Q | 3.76 | -3.23 | -3.76 | -3.45 | -3.24 | -3.48 | -3.53 | 0 |
| | 1.92 | -1.58 | -2.46 | -2.23 | -2.17 | -2.21 | -2.03 | -.19 |
| R | .25 | | -3.52 | | -3.28 | | -1.65 | |
| M'' | .88 | -.87 | -.05 | .06 | .01 | -.01 | -.47 | .45 |
| Q | .88 | .05 | .87 | -.01 | -.06 | .47 | .01 | 0 |
| C | .52 | .10 | .50 | .05 | .01 | .26 | | |
| R | .46 | | .41 | | .20 | | | |
| M''' | .11 | -.10 | .11 | -.11 | -.06 | .06 | 0 | 0 |
| M | 4.75 | 2.79 | 3.30 | 3.19 | 3.40 | 3.58 | 3.01 | 4.17 |
| | | | | | | | | |
| | | | | | | | | |

Member DL'

| | | | |
|---------------|---|------------|----|
| DL | = | 2132 | fk |
| LL-E60 | = | 1950 | |
| Impact | = | <u>536</u> | |
| Total | = | 4618 | |
| LL-H15-S12-44 | = | 240 | |
| Conc. | = | 88 | |
| Impact | = | <u>53</u> | |
| Total | = | 381 | |
| Sidewalk | = | 171 | |
| Design Moment | = | 5,170 | fk |

Member EE'

| | | | |
|---------------|---|------------|----|
| DL | = | 1267 | fk |
| LL-E60 | = | 1213 | |
| Impact | = | <u>425</u> | |
| Total | = | 2905 | |
| Sidewalk | = | 114 | |
| Design Moment | = | 3,282 | fk |

Member AB

| | | | |
|---------------|---|------------|----|
| DL | = | 3422 | fk |
| LL-E60 | = | 5005 | |
| Impact | = | <u>643</u> | |
| Total | = | 7070 | |
| LL-H15-S12-44 | = | 401 | |
| Conc. | = | 91 | |
| Impact | = | <u>68</u> | |
| Total | = | 560 | |
| Sidewalk | = | 239 | |
| Design Moment | = | 7,689 | fk |

Member BC

| | | | |
|---------------|---|------------|----|
| DL | = | 2326 | fk |
| LL-E60 | = | 2092 | |
| Impact | = | <u>481</u> | |
| Total | = | 4849 | |
| LL-H15-S12-44 | = | 272 | |
| Conc. | = | 75 | |
| Impact | = | <u>52</u> | |
| Total | = | 397 | |
| Sidewalk | = | 169 | |
| Design Moment | = | 5,465 | fk |

Member CD

| | | | |
|---------------|---|------------|----|
| DL | = | 1666 | fk |
| LL-E60 | = | 1551 | |
| Impact | = | <u>398</u> | |
| Total | = | 3615 | |
| LL-H15-H12-44 | = | 195 | |
| Conc. | = | 64 | |
| Impact | = | <u>44</u> | |
| Total | = | 303 | |
| Sidewalk | = | 125 | |
| Design Moment | = | 4,043 | fk |

Member DE

| | | | |
|---------------|---|------------|----|
| DL | = | 1192 | fk |
| LL-E60 | = | 1150 | |
| Impact | = | <u>345</u> | |
| Total | = | 2687 | |
| LL-H15-S12-44 | = | 140 | |
| Conc. | = | 56 | |
| Impact | = | <u>57</u> | |
| Total | = | 233 | |
| Sidewalk | = | 100 | |
| Design Moment | = | 3,020 | fk |

Influence Line Computations - Fourth Set

Load at B

Panel 1

$$-Q_A = \frac{(.0942 - 4)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)4} = 6.14$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)4} = 1.57$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)4} = -1.20$$

$$-Q_C = \frac{(-.125 \times 30 - 22.5 \times .0443)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - 22.5 \times .0443)}{2(2 - .0443)4} = -.30$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)3} = -1.16$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)3} = -.40$$

Panel 4

$$-Q_D = \frac{-2(.125 \times 30)}{4 \times 2} = -.94$$

$$-Q_E = \frac{(-.125 \times 30)}{4} = -.94$$

$$Q_{R4} = \frac{(-.125 \times 30)}{4 \times 2} = -.47$$

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Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -0.94$$

$$-Q_T = \frac{-.125 \times 30}{4} = -0.94$$

$$Q_{R5} = \frac{-.125 \times 30}{4 \times 2} = -0.47$$

Panel 6

$$-Q_T = \frac{(-.125 \times 30 + .0482 \times 30)}{2(2 - .0482)} = -0.82$$

$$-Q_G = \frac{(.0507 \times 2 - 3)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)3} = -0.79$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)3} = -0.27$$

Panel 7

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -0.87$$

$$-Q_H = \frac{(.0463 \times 1 - 4)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)4} = -0.86$$

$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)4} = -0.22$$

Panel 8

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

$$-Q_I = \frac{(.0942 \times 1 - 4)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)4} = -0.88$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)4} = -0.22$$

Load at C

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)4} = 5.27$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)4} = 1.35$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)4} = 5.17$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)4} = 1.31$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)3} = -2.31$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)3} = -.79$$

Panel 4

$$-Q_D = \frac{-2(.25 \times 30)}{4 \times 2} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30)}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4 \times 2} = -.94$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. In the second part, we shall consider the case of a single particle.

3. The third part is devoted to the case of a system of particles.

4. In the fourth part, we shall discuss the results of our calculations.

5. The fifth part is devoted to a discussion of the experimental results.

6. In the sixth part, we shall discuss the conclusions of our work.

7. The seventh part is devoted to a discussion of the literature.

8. In the eighth part, we shall discuss the results of our calculations.

9. The ninth part is devoted to a discussion of the experimental results.

10. In the tenth part, we shall discuss the conclusions of our work.

11. The eleventh part is devoted to a discussion of the literature.

12. In the twelfth part, we shall discuss the results of our calculations.

13. The thirteenth part is devoted to a discussion of the experimental results.

Panel 5

$$-Q_T = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -0.94$$

Panel 6

$$-Q_T = -1.64$$

$$-Q_G = -1.58$$

$$Q_{R6} = -0.54$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.72$$

$$Q_{R7} = -0.44$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.76$$

$$Q_{R8} = -0.45$$

Load at D

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)4} = 4.38$$

$$-Q_B = \frac{(.625 \times 30 - .0866 \times 18.75)}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{(.625 \times 30 - .0866 \times 18.75)}{2(2 - .0866)4} = 1.12$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)4} = 4.31$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)4} = 1.09$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)3} = 3.98$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)3} = 1.37$$

Panel 4

$$-Q_D = \frac{-2(.375 \times 30)}{4 \times 2} = -2.82$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.82$$

$$Q_{R4} = \frac{(-.375 \times 30)}{4 \times 2} = -1.41$$

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R_5} = -1.41$$

Panel 6

$$-Q_I = -2.46$$

$$-Q_G = -2.37$$

$$Q_{R_6} = -0.81$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.58$$

$$Q_{R_7} = -0.66$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.64$$

$$Q_{R_8} = -0.67$$

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Load at E

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)4} = 3.51$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)} = 3.59$$

$$Q_{R_1} = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)4} = .90$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)4} = 3.44$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R_2} = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)4} = .87$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)3} = 3.18$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

$$Q_{R_3} = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)3} = 1.10$$

Panel 4

$$-Q_D = \frac{-2(-.5 \times 30)}{4 \times 2} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R_4} = \frac{(.5 \times 30)}{4 \times 2} = 1.88$$

Panel 5

$$-Q_E = -3.76$$

$$-Q_F = -3.76$$

$$Q_{R_5} = -1.88$$

Panel 6

$$-Q_F = -3.28$$

$$-Q_G = -3.16$$

$$Q_{R_6} = -1.08$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.44$$

$$Q_{R_7} = -0.88$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.52$$

$$Q_{R_8} = -0.90$$

Determination of formulae for Panel Constant Computations

el 1

$$5 + 4 + \left[\frac{(3 - .0866)(.0942 - 4)}{2(2 - .0866)} \right] A + \left[2 + \frac{(3 - .1732)(.0942 - 4)}{2(2 - .0866)} \right] B = -Q_A$$

$$2.52A - .90B = -Q_A$$

$$1.5 - \left[\frac{(3 - .1732)4}{2(2 - .0866)} \right] B + \left[2 - \frac{(3 - .0866)4}{2(2 - .0866)} \right] A = -Q_B$$

$$2.54B - 1.04A = -Q_B$$

el 2

$$5 + 4 + \left[\frac{(3 - .0443)(.0463 - 4)}{2(2 - .0443)} \right] A + \left[2 + \frac{(3 - .0886)(.0463 - 4)}{2(2 - .0443)} \right] B = -Q_A$$

$$2.52A - .93B = -Q_A$$

$$3 - \left[\frac{(3 - .0886)4}{2(2 - .0443)} \right] B + \left[2 - \frac{(3 - .0443)4}{2(2 - .0443)} \right] A = -Q_B$$

$$4.03B - 1.02A = -Q_B$$

nel 3

$$5x2 + 3 + \left[\frac{(3 - .0482)(.0507x2-3)}{2(2 - .0482)} \right] A + \left[1.5 + \frac{(3 - .0946)(.0507x2-3)}{2(2 - .0482)} \right] B = -Q_A$$

$$3.31A - .65B = -Q_A$$

$$4.5 - \left[\frac{(3 - .0946)3}{2(2 - .0482)} \right] B + \left[1.5 - \frac{(3 - .0482)3}{2(2 - .0482)} \right] A = -Q_B$$

$$5.26B - .77A = -Q_B$$

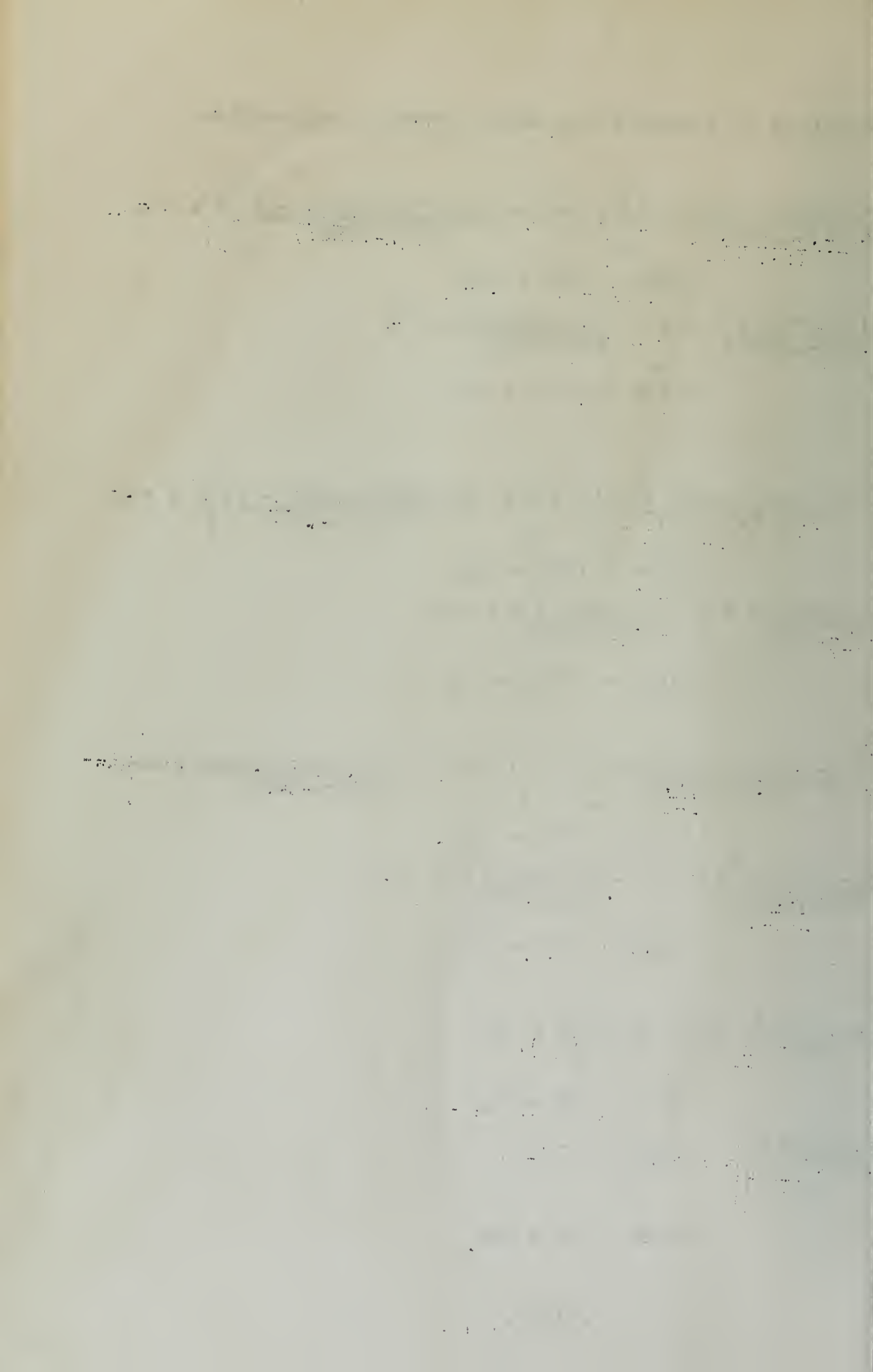
nel 4

$$4.5 + 2 + \left[\frac{3(-2)}{4} \right] A + \left[1 + \frac{3(-2)}{4} \right] B = -Q_A$$

$$5.0A - .5B = -Q_A$$

$$2 + 6 - \left[\frac{3(2)}{4} \right] B + \left[1 - \frac{3(2)}{4} \right] A = -Q_B$$

$$6.5B - .5A = -Q_B$$



Panel 5

$$\left[1.5 \times 4 + \frac{2}{4} \right] E - \frac{2}{4} F = -Q_E$$

$$6.5E - 0.5F = -Q_E$$

$$\left[1.5 \times 3 + \frac{2}{4} \right] F - \frac{2}{4} E = -Q_F$$

$$5.0F - 0.5E = -Q_F$$

Panel 6

$$\left[3 + 1.5 \times 3 - \frac{(3-2 \times .0482)3}{2(2-.0482)} \right] F + \left[\frac{3}{2} - \frac{(3-.0482)(3)}{2(2-.0482)} \right] G = -Q_F$$

$$5.26F - 0.77G = -Q_F$$

$$\left[2 + 3 + \frac{(3-.0482)(.0507 \times 2 - 3)}{2(2-.0482)} \right] G + \left[\frac{3}{2} + \frac{(3-2 \times .0482)(.0507 \times 2 - 3)}{2(2-.0482)} \right] F = -Q_G$$

$$3.81G - 0.65F = -Q_G$$

Panel 7

$$\left[4 + 1.5 \times 2 - \frac{(3-2 \times .0443)4}{2(2-.0443)} \right] G + \left[\frac{4}{2} - \frac{(3-.0443)4}{2(2-.0443)} \right] H = -Q_G$$

$$4.03G - 1.02H = -Q_G$$

$$\left[1 + 4 + \frac{(3-.0443)(.0463 \times 1 - 4)}{2(2-.0443)} \right] H + \left[\frac{4}{2} + \frac{(3-2 \times .0443)(.0463 \times 1 - 4)}{2(2-.0443)} \right] G = -Q_H$$

$$2.52H - 0.93G = -Q_H$$

Panel 8

$$\left[4 + 1.5 \times 1 - \frac{(3-2 \times .0866)4}{2(2-.0866)} \right] F + \left[\frac{4}{2} - \frac{(3-.0866)4}{2(2-.0866)} \right] I = -Q_H$$

$$2.54H - 1.040 = -Q_H$$

$$\left[.5 \times 1 + 4 + \frac{(3-.0866)(.0942 \times 1 - 4)}{2(2-.0866)} \right] I + \left[\frac{4}{2} - \frac{(3-2 \times .0866)(.0942 \times 1 - 4)}{2(2-.0866)} \right] H = -Q_I$$

$$2.52I - 0.90 = -Q_I$$

$$-\frac{1}{2} \left(\frac{1}{1-x} \right) = -\frac{1}{2} \sum_{n=0}^{\infty} x^n$$

$$12 \cdot 2 = 24$$

$$(12 \cdot 2) \cdot 2 = 48$$

Joint Constant Computation - Load at B

Panel 1

$$2.52A - .90B = 6.14$$

$$-1.04A + 2.54B = 6.28$$

$$A = 3.89 \quad B = 4.07$$

$$R_1 = \frac{2.91 \times 3.89 + 2.83 \times 4.07}{3.82} + 1.57 = 7.45$$

$$M_{AB} = 4(3.89 + \frac{4.07}{2} - 7.45) = -6.12$$

$$M_{BA} = 4(4.07 + \frac{3.89}{2} - 7.45) = -5.80$$

Panel 2

$$2.52B - .93C = -1.20$$

$$-1.02B + 4.03C = -1.21$$

$$B = -.65 \quad C = -.46$$

$$R_2 = \frac{-2.96 \times .65 - 2.91 \times .46}{3.92} - .30 = -1.13$$

$$M_{BC} = 4(-.65 - \frac{.46}{2} + 1.13) = 1.00$$

$$M_{CB} = 4(-.46 - \frac{.65}{2} + 1.13) = 1.40$$

Panel 3

$$3.81C - .65D = -1.16$$

$$-.77C + 5.25D = -1.19$$

$$C = -.35 \quad D = -.28$$

$$R_3 = \frac{-2.95 \times .35 - 2.90 \times .28}{3.90} - .40 = -.87$$

$$M_{CD} = 3(-.35 - \frac{.28}{2} + .87) = 1.14$$

$$M_{DC} = 3(-.28 - \frac{.35}{2} + .87) = 1.26$$

Panel 4

$$5.0D - .5E = -.94$$

$$-.5D + 6.5E = -.94$$

$$D = -.20 \quad E = -.16$$

$$R_4 = 3/4(-.20 - .16) + .47 = -.74$$

$$M_{DE} = 2(-.20 - \frac{.16}{2} + .74) = .92$$

$$M_{ED} = 2(-.16 - \frac{.20}{2} + .74) = .96$$

anel 5

$$6.5E - 0.5F = -0.94$$

$$-0.5E + 5.0F = -0.94$$

$$E = -0.16$$

$$F = -0.20$$

$$R_5 = \frac{3}{4}(-.20 - .16) - 0.47 = -.74$$

$$M_{EF} = 2(-.16 - \frac{.20}{2} + .74) = .96$$

$$M_{FE} = 2(-.20 - \frac{.16}{2} + .74) = .92$$

anel 6

$$5.26F - 0.77G = -0.82$$

$$-0.65F + 3.81G = -0.79$$

$$F = -0.19 \quad G = -0.24$$

$$R_6 = \frac{-2.90 \times .19 - 2.95 \times .24}{3.90} - 0.27 = -0.59$$

$$M_{FG} = 3(-.19 - \frac{.24}{2} + .59) = .84$$

$$M_{GF} = 3(-.24 - .19 + .59) = .75$$

anel 7

$$4.03G - 1.02H = -0.87$$

$$-0.93G + 2.52H = -0.86$$

$$G = -0.33 \quad H = -0.46$$

$$R_7 = \frac{-2.91 \times .33 - 2.96 \times .46}{3.91} - 0.22 = -0.82$$

$$M_{GH} = 4(-.33 - \frac{.44}{2} + .82) = 1.04$$

$$M_{HG} = 4(-.46 - \frac{.33}{2} + .82) = .80$$

anel 8

$$2.54H - 1.04I = -0.90$$

$$-0.90H + 2.52I = -0.88$$

$$H = -0.58 \quad I = -0.56$$

$$R_8 = \frac{-2.83 \times 0.58 - 2.91 \times 0.56}{3.83} - .22 = -1.08$$

$$M_{HI} = 4(-.58 - \frac{.56}{2} + 1.08) = .88$$

$$M_{IH} = 4(-.56 - \frac{.58}{2} + 1.08) = .92$$

Load at C

Panel 1

$$\begin{aligned} 2.52A - .90B &= 5.27 \\ -1.04A + 2.54B &= 5.38 \end{aligned}$$

$$A = 3.33 \quad B = 3.48$$

$$R_1 = \frac{2.91 \times 3.33 + 2.83 \times 3.48}{3.82} + 1.35 = 6.47$$

$$M_{AB} = 4\left(3.33 + \frac{3.48}{2} - 6.47\right) = -5.88$$

$$M_{BA} = 4\left(3.48 + \frac{3.33}{2} - 6.47\right) = -5.32$$

Panel 2

$$\begin{aligned} 2.52B - .93C &= 5.17 \\ -1.02 + 4.03C &= 5.23 \\ B = 2.79 \quad C &= 2.0 \end{aligned}$$

$$R_2 = \frac{2.96 \times 2.79 + 2.91 \times 2.0}{3.92} + 1.31 = 4.90$$

$$M_{BC} = 4\left(2.79 + \frac{2.0}{2} - 4.90\right) = -4.44$$

$$M_{CB} = 4\left(2.0 + \frac{2.79}{2} - 4.90\right) = -6.04$$

Panel 3

$$\begin{aligned} 3.81C - .65D &= -2.31 \\ -.77C + 5.26D &= -2.33 \end{aligned}$$

$$C = -.70 \quad D = -.56$$

$$R_3 = \frac{-2.95 \times .70 - 2.90 \times .56}{3.90} - .79 = -1.74$$

$$M_{CD} = 3\left(-.70 - \frac{.56}{2} + 1.74\right) = 2.28$$

$$M_{DC} = 3\left(-.56 - \frac{.70}{2} + 1.74\right) = 2.49$$

Panel 4

$$5.0D - .5E = -1.87$$

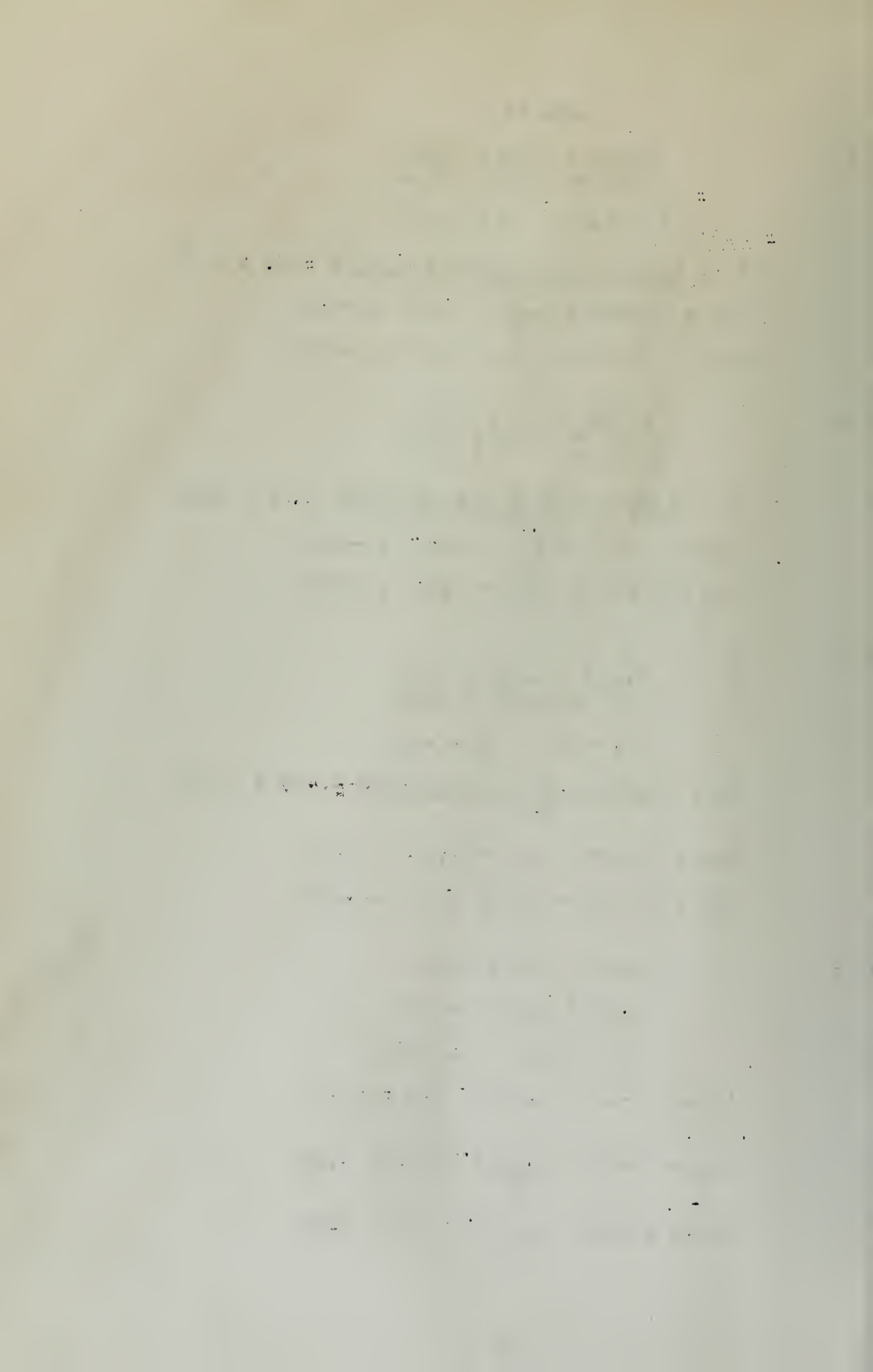
$$-.5D + 6.5E = -1.87$$

$$D = -.41 \quad E = -.32$$

$$R_4 = \frac{3}{4}(-.41 - .32) - .94 = -1.50$$

$$M_{DE} = 2\left(-.41 - \frac{.32}{2} + 1.50\right) = 1.86$$

$$M_{ED} = 2\left(-.32 - \frac{.41}{2} + 1.50\right) = 1.96$$



Panel 5

$$E = -0.32$$

$$F = -0.40$$

$$R_5 = -1.48$$

$$M_{EF} = 1.92$$

$$M_{FE} = 1.84$$

Panel 6

$$F = -0.73$$

$$G = -0.15$$

$$R_6 = -1.18$$

$$M_{FG} = 1.68$$

$$M_{GF} = 1.50$$

Panel 7

$$G = -0.86$$

$$H = -0.85$$

$$R_7 = -1.64$$

$$M_{GH} = 2.05$$

$$M_{HG} = 1.60$$

Panel 8

$$H = -1.16$$

$$I = -1.11$$

$$R_8 = -2.23$$

$$M_{HI} = 1.75$$

$$M_{IH} = 1.84$$

Load at D

$$\begin{aligned} 2.52A - .90B &= 4.38 \\ -1.04A + 2.54B &= 4.49 \end{aligned}$$

$$A = 2.79 \quad B = 2.91$$

$$R_1 = \frac{2.91 \times 2.79 + 2.83 \times 2.91}{3.82} - 1.12 = 5.40$$

$$M_{AB} = 4\left(2.79 + \frac{2.91}{2} - 5.40\right) = -4.64$$

$$M_{BA} = 4\left(2.91 + \frac{2.79}{2} - 5.40\right) = -4.40$$

Panel 2

$$\begin{aligned} 2.52B - .93C &= 4.31 \\ -1.02B + 4.03C &= 4.36 \end{aligned}$$

$$B = 2.33 \quad C = 1.66$$

$$R_2 = \frac{2.96 \times 2.33 + 2.91 \times 1.66}{3.92} - 1.09 = 4.09$$

$$M_{BC} = 4\left(2.33 + \frac{1.66}{2} - 4.09\right) = -3.72$$

$$M_{CB} = 4\left(1.66 + \frac{2.33}{2} - 4.09\right) = -5.08$$

Panel 3

$$\begin{aligned} 3.81C - .65D &= 3.98 \\ -.77C + 5.26D &= 4.12 \end{aligned}$$

$$C = 1.21 \quad D = .96$$

$$R_3 = \frac{2.95 \times 1.21 + 2.90 \times .96}{3.90} - 1.37 = 2.99$$

$$M_{CD} = 3\left(1.21 + \frac{.96}{2} - 2.99\right) = -3.90$$

$$M_{DC} = 3\left(.96 + \frac{1.21}{2} - 2.99\right) = -4.29$$

Panel 4

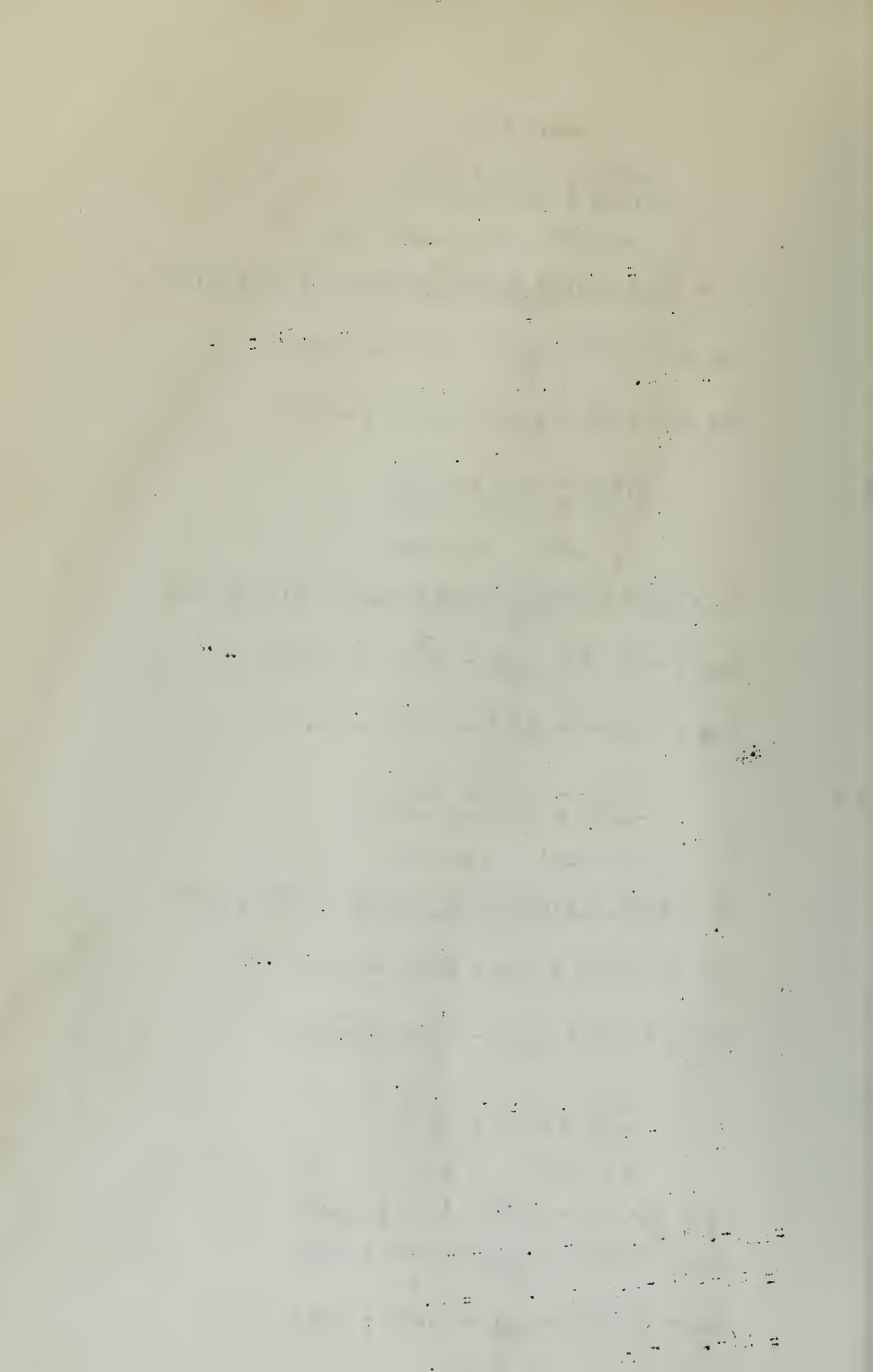
$$\begin{aligned} 5.0D - .5E &= -2.82 \\ -.5D + 6.5E &= -2.82 \end{aligned}$$

$$D = -.61 \quad E = -.48$$

$$R_4 = \frac{3(-.61 - .49)}{4} - 1.41 = -2.23$$

$$M_{DE} = 2\left(-.61 - \frac{.48}{2} + 2.23\right) = 2.76$$

$$M_{ED} = 2\left(-.48 - \frac{.61}{2} + 2.23\right) = 2.90$$



Panel 5

$$E = -0.48$$

$$F = -1.60$$

$$R_5 = -2.22$$

$$M_{EF} = 2.88$$

$$M_{FE} = 2.76$$

Panel 6

$$F = -0.57$$

$$G = -1.72$$

$$R_6 = -1.77$$

$$M_{FG} = 2.52$$

$$M_{GF} = 2.25$$

Panel 7

$$G = -0.99$$

$$H = -1.39$$

$$R_7 = -2.46$$

$$M_{GH} = 3.12$$

$$M_{HG} = 2.40$$

Panel 8

$$H = -1.74$$

$$I = -1.68$$

$$R_8 = -3.24$$

$$M_{HI} = 2.64$$

$$M_{IH} = 2.76$$

1. 1. 1.

2. 2. 2.

3. 3. 3.

4. 4. 4.

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Load at E

Panel 1

$$2.52A - .91B = 3.51$$

$$-1.04A + 2.54B = 3.59$$

$$A = 2.22 \quad B = 2.33$$

$$R_1 = \frac{2.91 \times 2.22 + 2.83 \times 2.33}{3.82} + .90 = 4.32$$

$$M_{AB} = 4(2.22 + \frac{2.33}{2} - 4.32) = -3.76$$

$$M_{BA} = 4(2.33 + \frac{2.22}{2} - 4.32) = -3.52$$

Panel 2

$$2.52B - .93C = 3.44$$

$$-1.02B + 4.03C = 3.49$$

$$B = 1.86 \quad C = 1.33$$

$$R_2 = \frac{2.96 \times 1.86 + 2.91 \times 1.33}{3.92} + .87 = 3.26$$

$$M_{BC} = 4(1.86 + \frac{1.33}{2} - 3.26) = -2.96$$

$$M_{CB} = 4(2.33 + \frac{1.86}{2} - 3.26) = -4.00$$

Panel 3

$$3.81C - .65D = 3.18$$

$$-.77C + 5.26D = 3.30$$

$$C = .97 \quad D = .77$$

$$R_3 = \frac{2.95 \times .97 + 2.90 \times .77}{3.90} + 1.10 = 2.40$$

$$M_{CD} = 3(.97 + .77/2 - 2.40) = -3.15$$

$$M_{DC} = 3(.77 + .97/2 - 2.40) = -3.84$$

Panel 4

$$5.0D - .5E = 3.75$$

$$-.5D + 6.5E = 3.75$$

$$D = .82 \quad E = .64$$

$$R_4 = 3/4(.82 + .64) + 1.88 = 2.97$$

$$M_{DE} = 2(.82 + .64/2 - 2.97) = -3.66$$

$$M_{ED} = 2(.64 + .82/2 - 2.97) = -3.84$$

Panel 5

$$E = -0.64$$

$$F = -0.80$$

$$R_5 = -2.96$$

$$M_{EF} = 3.84$$

$$M_{FE} = 3.68$$

Panel 6

$$F = -0.76$$

$$G = -0.96$$

$$R_6 = -2.36$$

$$M_{FG} = 3.36$$

$$M_{GF} = 3.00$$

Panel 7

$$G = -1.32$$

$$H = -1.84$$

$$R_7 = -3.28$$

$$M_{GH} = 4.16$$

$$M_{HG} = 3.20$$

Panel 8

$$H = -2.32$$

$$I = -2.24$$

$$R_8 = -4.32$$

$$M_{HI} = 3.52$$

$$M_{IH} = 3.68$$

First Moment Corrections - Load at B

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -1.00$$

$$A = -.16 \quad B = -.46$$

$$R_1 = \frac{-2.91 \times .16 - 2.83 \times .46}{3.83} = -0.46$$

$$M_{AB} = 4(-.16 - .46/2 + .46) = .28$$

$$M_{BA} = 4(-.46 - .16/2 + .46) = -.32$$

Panel 2

$$2.52B - .93C = 5.80$$

$$-1.02B + 4.03C = -1.14$$

$$B = 2.42 \quad C = .33$$

$$R_2 = \frac{2.90 \times 2.42 + 2.91 \times .33}{3.81} = 2.07$$

$$M_{BC} = 4(2.42 + .33/2 - 2.07) = 2.04$$

$$M_{CB} = 4(.33 + 2.42/2 - 2.07) = -2.16$$

Panel 3

$$3.81C - .65D = -1.40$$

$$-.77C + 5.26D = -.92$$

$$C = -.40 \quad D = -.23$$

$$R_3 = \frac{-2.95 \times .40 - 2.90 \times .23}{3.80} = -.47$$

$$M_{CD} = 3(-.40 - .23/2 + .47) = -.12$$

$$M_{DC} = 3(-.23 - .40/2 + .47) = .12$$

Panel 4

$$6.5D - 0.5E = -1.26$$

$$-0.5D + 5.0E = -.96$$

$$D = -.22 \quad E = -.21$$

$$R_4 = 3/4(-.22 - .21) = -.32$$

$$M_{DE} = 2(-.22 - .21/2 + .32) = 0$$

$$M_{ED} = 2(-.21 - .22/2 + .32) = 0$$

Panel 5

$$5.0E - 0.5F = -.96$$

$$-0.5 + 6.5F = -.84$$

$$E = -.21, F = -.14$$

$$R_5 = \frac{3}{2} (-.21 - .14) = -.26$$

$$M_{EF} = 2(-.21 - \frac{.14}{2} + .26) = -.04$$

$$M_{FE} = 2(-.14 - \frac{.21}{2} + .26) = .04$$

Panel 6

$$5.26F + 0.77G = -.92$$

$$-0.65F + 3.81G = -1.04$$

$$F = -.22, G = -.31$$

$$R_6 = \frac{-2.90 \times .22 - 2.95 \times .31}{3.90} = .40$$

$$M_{FG} = 3(-.22 - \frac{.31}{2} + .40) = .06$$

$$M_{GF} = 3(-.31 - \frac{.22}{2} + .40) = -.06$$

Panel 7

$$4.03G - 1.02H = -.75$$

$$-0.93G + 2.52H = -.88$$

$$G = -.30, H = -.46$$

$$R_7 = \frac{-2.91 \times .30 - 2.96 \times .46}{3.91} = -.57$$

$$M_{GH} = 4(-.30 - \frac{.46}{2} + .57) = .16$$

$$M_{HG} = 4(-.46 - \frac{.30}{2} + .57) = -.16$$

Panel 8

$$2.54H - 1.04I = -.60$$

$$-0.94H + 2.52I = 0$$

$$H = -.37, I = -.13$$

$$R_8 = \frac{-2.33 \times .37 - 2.91 \times .13}{3.83} = -.37$$

$$M_{HI} = 4(-.37 - \frac{.13}{2} + .37) = -.24$$

$$M_{IH} = 4(-.13 - \frac{.37}{2} + .37) = .24$$

Second Moment Corrections-Load at B

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -2.04$$

$$A = -.34, B = -.94$$

$$R_1 = \frac{-2.91 \times .34 - 2.83 \times .94}{3.83} = -.95$$

$$M_{AB} = 4(-.34 - \frac{.94}{2} + .95) = .56$$

$$M_{BA} = 4(-.94 - \frac{.34}{2} + .95) = -.64$$

Panel 3

$$3.81C - .65D = -2.18$$

$$-.77C + 5.26D = 0$$

$$C = -.58, D = -.08$$

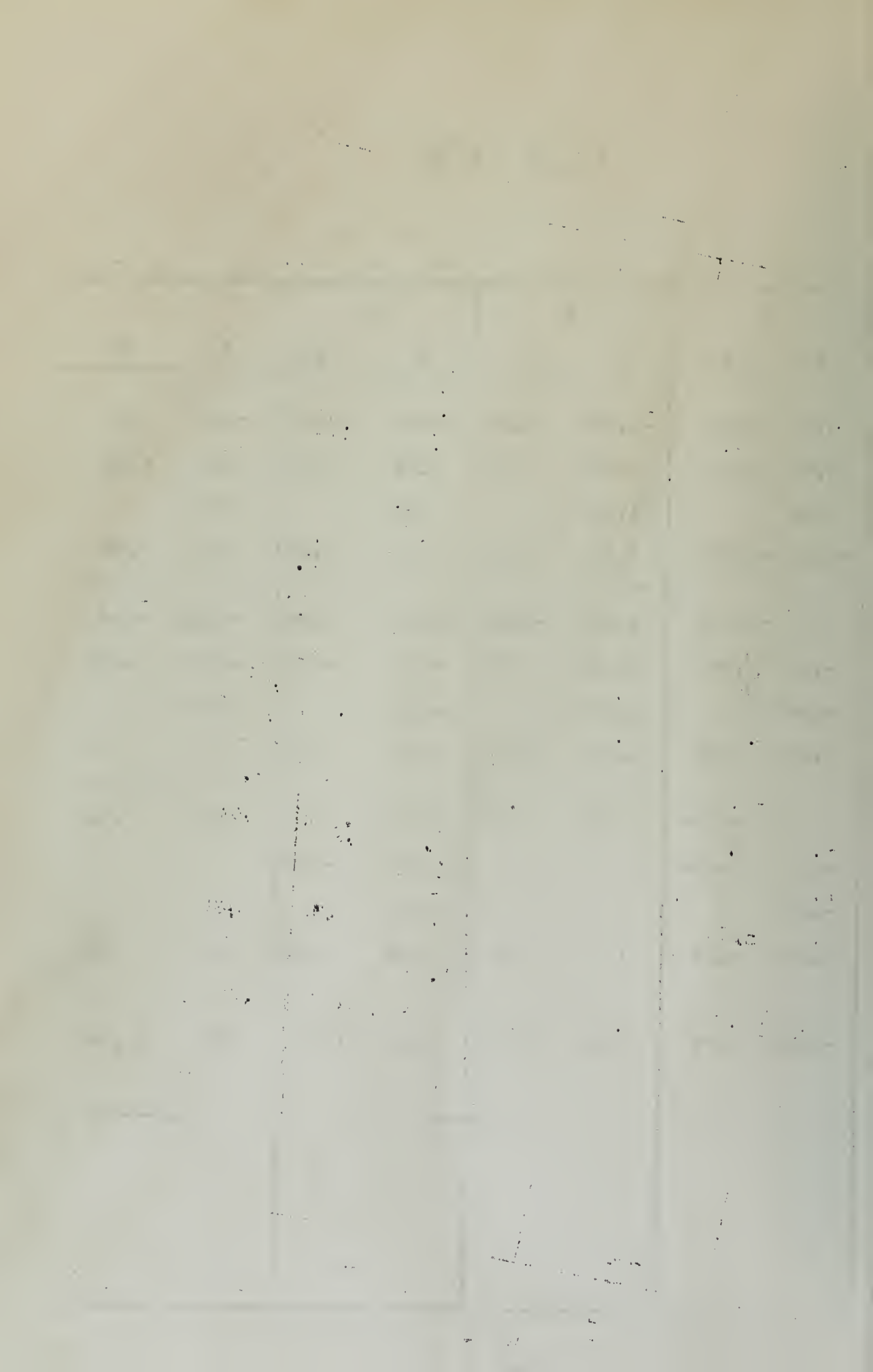
$$R_3 = \frac{-2.95 \times .58 - 2.90 \times .08}{3.90} = -.50$$

$$M_{CD} = 3(-.58 - \frac{.08}{2} + .50) = -.36$$

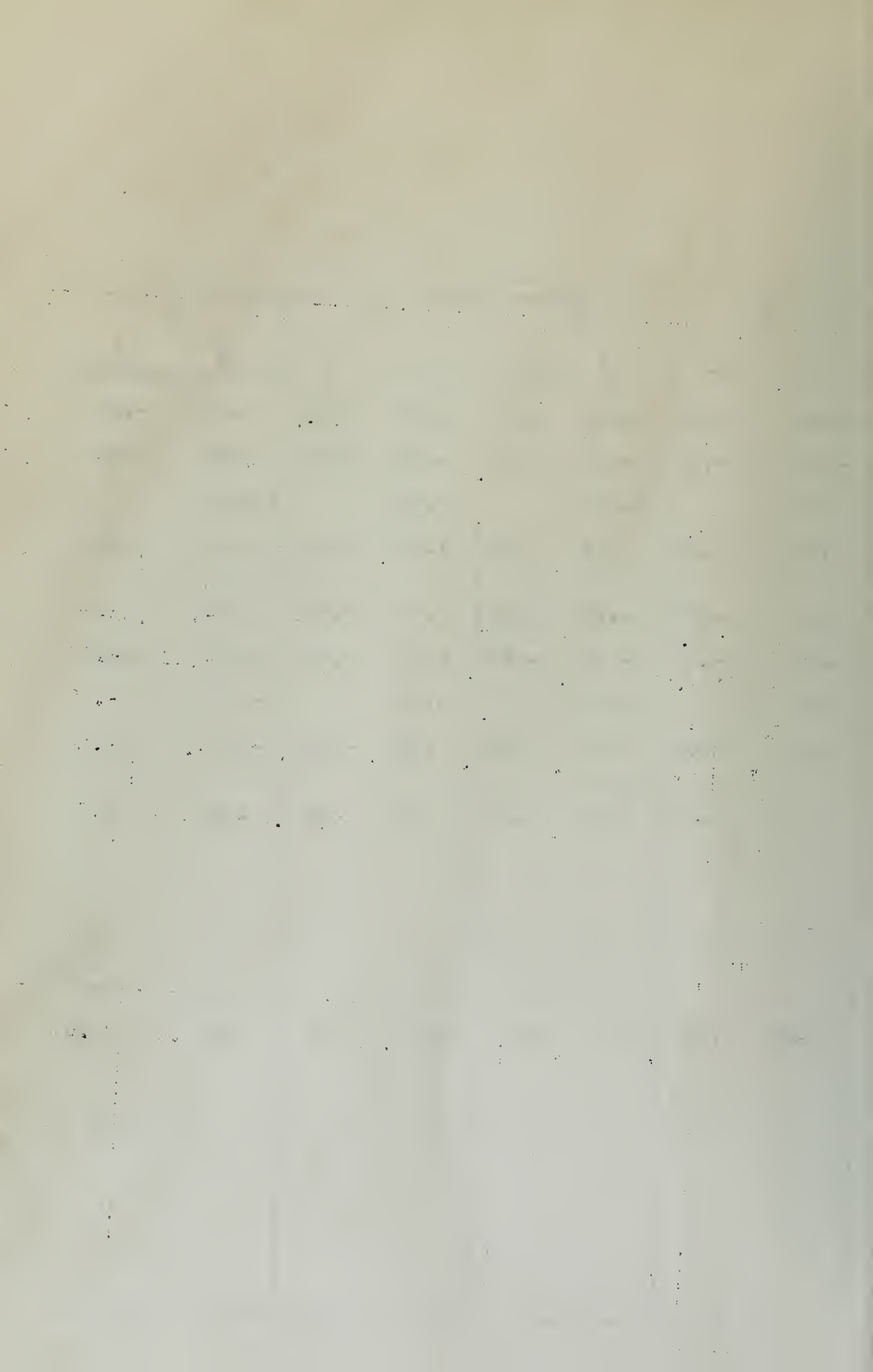
$$M_{DC} = 3(-.08 - \frac{.58}{2} + .50) = .39$$

Load at B

| anel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|------|
| oint | A | B | B | C | C | D | D | E |
| Q | 6.14 | 6.28 | -1.20 | -1.21 | -1.16 | -1.19 | -.94 | -.94 |
| C | 3.89 | 4.07 | -.65 | -.46 | -.35 | -.28 | -.20 | -.16 |
| R | 7.45 | | -1.13 | | -.87 | | -.74 | |
| E' | -6.12 | -5.80 | 1.00 | 1.40 | 1.14 | 1.26 | .92 | .96 |
| Q | 0 | -1.00 | 5.80 | -1.14 | -1.40 | -.92 | -1.26 | -.98 |
| C | -.16 | -.46 | 2.42 | .32 | -.40 | -.23 | -.22 | -.21 |
| R | -.46 | | 2.07 | | -.47 | | -.32 | |
| E'' | .28 | -.32 | 2.04 | -2.16 | -.12 | .12 | 0 | 0 |
| Q | 0 | -2.04 | .32 | .12 | -2.16 | 0 | -.12 | .04 |
| C | -.34 | -.94 | | | -.58 | -.08 | | |
| R | -.95 | | | | -.50 | | | |
| E''' | .56 | -.64 | 0 | 0 | -.36 | .39 | .0 | .00 |
| E'''' | -5.28 | -6.76 | 3.04 | -0.76 | .66 | 1.77 | .92 | .96 |



| Panel
Point | 5 | | 6 | | 7 | | 8 | |
|----------------|------|------|------|-------|------|------|-------|------|
| | E | F | F | G | G | H | H | I |
| Q | -.94 | -.94 | -.82 | -.79 | -.87 | -.86 | -.90 | -.88 |
| X | -.16 | -.20 | -.19 | -.24 | -.33 | -.46 | -.58 | -.56 |
| R | -.74 | | -.59 | | -.82 | | -1.08 | |
| H' | .96 | .92 | .34 | .75 | 1.04 | .80 | .88 | .92 |
| Q | -.96 | -.84 | -.92 | -1.04 | -.75 | -.88 | -.80 | 0 |
| C | -.21 | -.14 | -.22 | -.31 | -.50 | -.46 | -.37 | -.13 |
| R | -.26 | | -.40 | | -.57 | | -.37 | |
| H'' | -.04 | -.04 | .06 | -.06 | .16 | -.16 | -.24 | .24 |
| Q | 0 | -.06 | -.04 | .16 | .06 | .24 | .16 | 0 |
| C | | | | | | | | |
| R | | | | | | | | |
| H''' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H | .92 | .96 | .90 | .69 | 1.20 | .64 | .64 | 1.16 |
| | | | | | | | | |
| | | | | | | | | |



First Moment Corrections - Load at C

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = 4.44$$

$$A = .73 \quad B = 2.05$$

$$R_1 = \frac{2.91 \times .73 + 2.83 \times 2.05}{3.83} = 2.06$$

$$M_{AB} = 4(.73 + 2.05/2 - 2.06) = -1.24$$

$$M_{BA} = 4(2.05 + .73/2 - 2.06) = 1.40$$

Panel 2

$$2.52B - .93C = 5.32$$

$$-1.02B + 4.03C = -2.28$$

$$B = 2.10 \quad C = -.04$$

$$R_2 = \frac{2.93 \times 2.10 + 2.91 \times .04}{3.91} = 1.60$$

$$M_{BC} = 4(2.10 + .04/2 - 1.60) = 1.92$$

$$M_{CB} = 4(-.04 + 2.10/2 - 1.60) = -2.04$$

Panel 3

$$3.81C - 0.65D = 6.04$$

$$-0.77C + 5.26D = -1.86$$

$$C = 1.56 \quad D = -.12$$

$$R_3 = \frac{2.95 \times 1.56 + 2.90 \times .12}{3.90} = 1.09$$

$$M_{CD} = 3(1.56 + .12/2 - 1.09) = 1.23$$

$$M_{DC} = 3(-.12 + 1.56/2 - 1.09) = -1.29$$

Panel 4

$$6.5D - 0.5E = -2.49$$

$$-0.5D + 5.0E = -1.92$$

$$D = -.42 \quad E = -.42$$

$$R_4 = 3/4(-.42 - .42) = -.63$$

$$M_{DE} = 2(-.42 + .42/2 + .63) = 0$$

$$M_{ED} = 2(-.42 - .42/2 + .63) = 0$$

Panel 5 $5.0E - 0.5F = -1.96$

$$-0.5E + 6.5F = -1.63$$

$$E = -.42 \quad F = -.29$$

$$R_5 = 3/4(-.42 - .29) = -.53$$

$$M_{EF} = 2(-.42 - .29/2 + .53) = -.06$$

$$M_{FE} = 2(-.29 - .42/2 + .53) = .06$$

Panel 6 $5.26F - 0.77G = -1.84$

$$-0.65F + 3.81G = -2.08$$

$$F = -.44 \quad G = -.62$$

$$R_6 = \frac{-2.90 \times .44 - 2.95 \times .62}{3.96} = -.80$$

$$M_{FG} = 3(-.44 - .62/2 + .80) = .15$$

$$M_{GF} = 3(-.29 - .44/2 + .80) = -.12$$

Panel 7 $4.03G - 1.02H = -1.50$

$$-0.93G + 2.52H = -1.76$$

$$G = -.60 \quad H = -.92$$

$$R_7 = \frac{-2.91 \times .60 - 2.96 \times .92}{3.91} = -1.14$$

$$M_{GH} = 4(-.60 - .92/2 + 1.14) = .32$$

$$M_{HG} = 4(-.92 - .60/2 + 1.14) = -.32$$

Panel 8 $2.54H - 1.04I = -1.60$

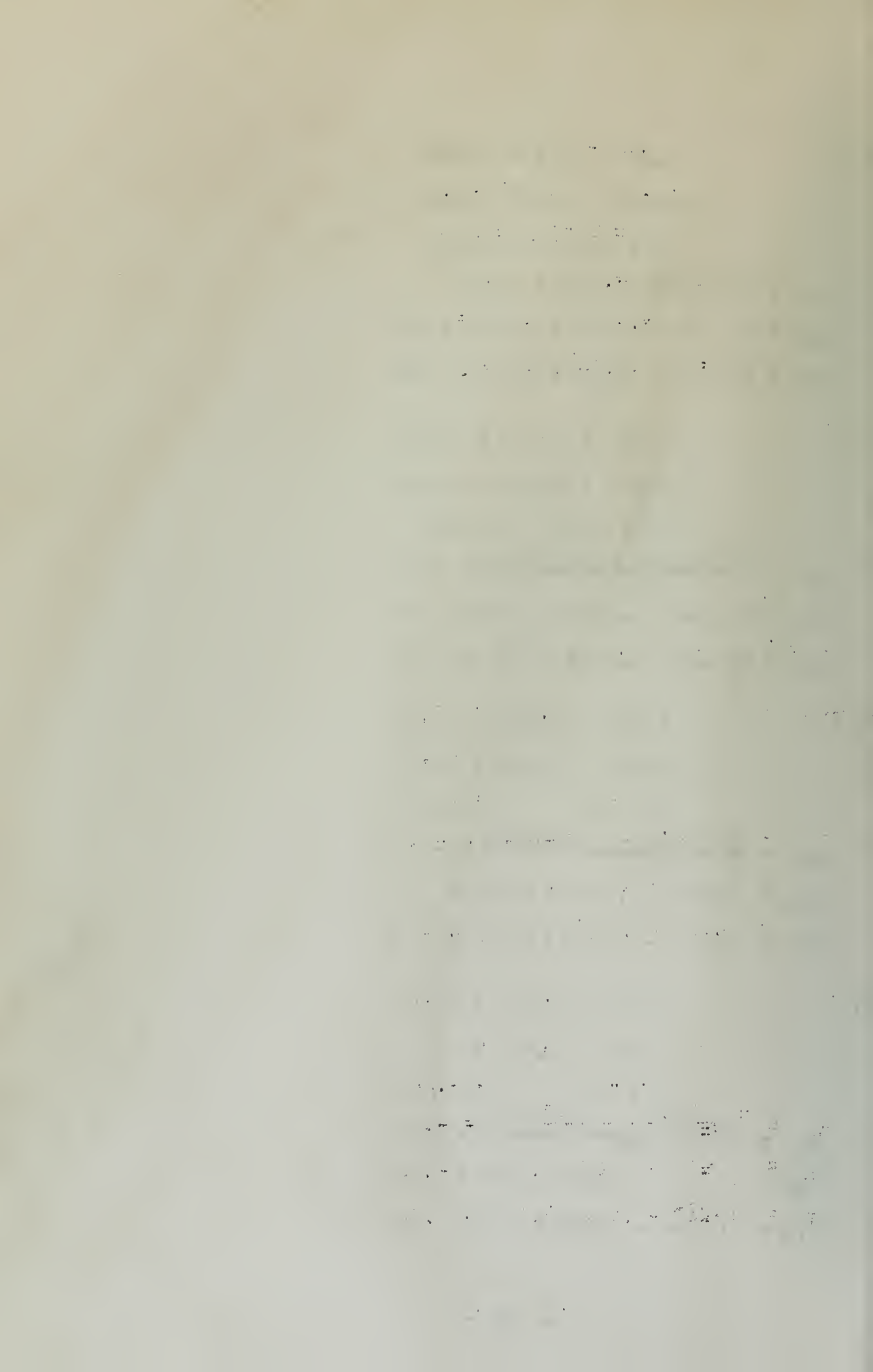
$$-0.90H + 2.52I = 0$$

$$H = -.74 \quad I = -.26$$

$$R_8 = \frac{-2.83 \times .74 - 2.91 \times .26}{3.83} = -.74$$

$$M_{HI} = 4(-.74 - .26/2 + .74) = -.52$$

$$M_{IH} = 4(-.26 - .74/2 + .74) = .44$$



Second Moment Corrections - Load at C

Panel 1

$$2.52A - 0.90B = 0$$

$$-1.04A + 2.54B = -1.92$$

$$A = -.32 \quad B = -.88$$

$$R_1 = \frac{-2.91 \times .32 - 2.83 \times .88}{3.83} = -.89$$

$$M_{AB} = 4(-.32 - .88/2 + .89) = .52$$

$$M_{BA} = 4(-.88 - .32/2 + .89) = -.60$$

Panel 2

$$2.52B - 0.93C = -1.40$$

$$-1.02B + 4.03C = -1.23$$

$$B = -.74 \quad C = -.49$$

$$R_2 = \frac{-2.96 \times .74 - 2.91 \times .49}{3.91} = -.93$$

$$M_{BC} = 4(-.74 - .49/2 + .93) = -.24$$

$$M_{CB} = 4(-.49 - .74/2 + .93) = .28$$

Panel 3

$$3.81C - 0.65D = 2.04$$

$$-0.77C + 5.28D = 0$$

$$C = .55 \quad D = .08$$

$$R_3 = \frac{2.95 \times .55 + 2.90 \times .08}{3.90} = .47$$

$$M_{CD} = 3(.55 + .08/2 - .47) = .36$$

$$M_{DC} = 3(.08 + .55/2 - .47) = -.36$$

Panel 4

$$6.5D - 0.5E = 1.29$$

$$-0.5D + 5.0E = .06$$

$$D = .20 \quad E = .03$$

$$R_4 = 2/4(.20 + .03) = .17$$

$$M_{DE} = 2(.20 + .03/2 - .17) = .08$$

$$M_{ED} = 2(.03 + .20/2 - .17) = -.08$$

nel 5

$$5.0E - 0.5F = 0$$

$$-0.5E + 6.5F = -.15$$

$$E = 0 \quad F = -.02$$

$$R_5 = 3/4(-.02) = -.02$$

$$M_{EF} = 0$$

$$M_{FE} = 0$$

nel 6

$$5.26F - 0.77G = -.06$$

$$-0.65F + 3.81G = -.32$$

$$F = -.02 \quad G = -.08$$

$$R_6 = \frac{-2.90 \times .02 - 2.95 \times .08}{3.90} = -.07$$

$$M_{FG} = 3(-.02 - .08/2 + .07) = .03$$

$$M_{GF} = 3(-.08 - .02/2 + .07) = -.06$$

nel 7

$$4.03G - 1.02H = .12$$

$$-0.93G + 2.52H = .52$$

$$G = .09 \quad H = .24$$

$$R_7 = \frac{2.91 \times .09 + 2.96 \times .24}{3.91} = .25$$

$$M_{GH} = 4(.09 + .24/2 - .25) = -.16$$

$$M_{HG} = 4(.24 + .09/2 - .25) = .16$$

nel 8

$$2.54H - 1.04I = .32$$

$$-0.90H - 2.52I = 0$$

$$H = .15 \quad I = .05$$

$$R_8 = \frac{2.83 \times .15 + 2.91 \times .05}{3.83} = .15$$

$$M_{HI} = 4(.15 + .05/2 - .15) = .10$$

$$M_{IH} = 4(.05 + .15/2 - .15) = -.10$$

Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 5.27 | 5.33 | 5.17 | 5.23 | -2.31 | -2.38 | -1.87 | -1.87 |
| α | 3.33 | 3.48 | 2.79 | 2.00 | - .70 | - .56 | - .41 | - .32 |
| R | 6.47 | | 4.90 | | -1.74 | | -1.50 | |
| M | -5.88 | -5.32 | -4.44 | -6.04 | 2.28 | 2.49 | 1.86 | 1.96 |
| Q | 0 | 4.44 | 5.32 | -2.28 | 6.04 | -1.86 | -2.49 | -1.92 |
| α | .73 | 2.05 | 2.10 | - .04 | 1.56 | - .12 | - .42 | - .42 |
| R | 2.06 | | 1.60 | | 1.09 | | - .63 | |
| M' | -1.24 | 1.40 | 1.92 | -2.04 | 1.23 | -1.29 | 0 | 0 |
| Q | 0 | -1.92 | -1.40 | -1.23 | 2.04 | 0 | 1.29 | .06 |
| | - .32 | - .88 | - .74 | - .49 | .55 | .08 | .20 | .03 |
| R | - .89 | | - .93 | | .47 | | .17 | |
| M'' | .52 | - .60 | - .24 | .28 | .36 | - .36 | .08 | - .08 |
| H | -6.60 | -4.52 | -3.76 | -7.80 | 3.87 | .84 | 1.94 | 1.88 |

1. The first part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the success of any business or organization. The author provides a detailed overview of the various methods used to collect and analyze data, highlighting the strengths and weaknesses of each approach. The second part of the paper focuses on the application of these methods in a real-world context, using a case study to illustrate the practical implications of the research. The author concludes by summarizing the key findings and offering recommendations for future research and practice.

| 5 | | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|-------|
| E | F | F | G | G | H | H | I |
| 1.88 | -1.88 | -1.64 | -1.58 | -1.74 | -1.72 | -1.80 | -1.76 |
| .32 | - .40 | - .38 | - .48 | - .66 | - .93 | -1.16 | -1.12 |
| 1.48 | | -1.16 | | -1.64 | | -2.16 | |
| 1.92 | 1.84 | 1.68 | 1.50 | 2.08 | 1.60 | 1.76 | 1.84 |
| 1.96 | -1.68 | -1.84 | -2.08 | -1.50 | -1.76 | -1.60 | 0 |
| .42 | - .29 | - .44 | - .62 | - .60 | - .92 | - .74 | - .26 |
| .53 | | - .80 | | -1.14 | | - .74 | |
| .06 | .06 | .15 | - .12 | .32 | - .32 | - .52 | .44 |
| 0 | - .15 | - .06 | - .32 | .12 | .52 | .32 | 0 |
| 0 | - .02 | - .02 | - .08 | .09 | .24 | .15 | .05 |
| .02 | | - .07 | | .25 | | .15 | |
| 0 | 0 | .03 | - .06 | - .16 | .16 | .10 | - .10 |
| 1.86 | 1.90 | 1.86 | 1.32 | 2.24 | 1.44 | 1.34 | 2.28 |

1. The first part of the paper discusses the importance of maintaining accurate records of all transactions. This is essential for the proper management of the company's finances and for ensuring that all parties involved are kept up to date on the current status of the business.

2. The second part of the paper deals with the various methods used to collect and analyze data. This includes a detailed description of the different types of data that are collected, the methods used to collect this data, and the various techniques used to analyze the data. This part of the paper is particularly important as it provides a clear and concise overview of the data collection and analysis process.

3. The third part of the paper discusses the various methods used to collect and analyze data. This includes a detailed description of the different types of data that are collected, the methods used to collect this data, and the various techniques used to analyze the data. This part of the paper is particularly important as it provides a clear and concise overview of the data collection and analysis process.

4. The fourth part of the paper discusses the various methods used to collect and analyze data. This includes a detailed description of the different types of data that are collected, the methods used to collect this data, and the various techniques used to analyze the data. This part of the paper is particularly important as it provides a clear and concise overview of the data collection and analysis process.

5. The fifth part of the paper discusses the various methods used to collect and analyze data. This includes a detailed description of the different types of data that are collected, the methods used to collect this data, and the various techniques used to analyze the data. This part of the paper is particularly important as it provides a clear and concise overview of the data collection and analysis process.

Panel 5

$$-.5F + 6.5E = -2.90$$

$$5.0F - .5E = -2.52$$

$$E = -.49, F = -.55, R_5 = -1.70$$

$$I_{FE} = 2(-.49 - .55/2 + 1.70) = .04$$

$$I_{EF} = 2(-.55 - .49/2 + 1.70) = -1.02$$

Panel 6

$$-.77G + 5.26F = -2.76$$

$$3.01G - .65F = -3.12$$

$$F = -.66, G = -.93, R_6 = -1.20$$

$$I_{FG} = 3(-.66 - .93/2 + 1.20) = .21$$

$$I_{GF} = 3(-.93 - .66/2 + 1.20) = -.18$$

Panel 7

$$-1.02H + 4.03G = -2.25$$

$$2.52H - .93G = -2.64$$

$$G = -.91, H = -1.30, R_7 = -1.71$$

$$I_{GH} = 4(-.91 - 1.30/2 + 1.71) = .44$$

$$I_{HG} = 4(-1.30 - .91/2 + 1.71) = -.48$$

Panel 8

$$-1.04I + 2.54H = -2.40$$

$$2.52I - .90H = 0$$

$$H = -1.11, I = -.39, R_8 = -1.12$$

$$I_{HI} = 4(-1.11 - .39/2 + 1.12) = -.72$$

$$I_{IH} = 4(-.39 - 1.11/2 + 1.12) = .72$$

Influence Line Corrections - Second Set - Load at D

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -.80$$

$$A = -.13, B = -.37, R_1 = -.37$$

$$M_{AB} = 4(-.13 - .37/2 + .37) = .24$$

$$M_{BA} = 4(-.37 - .13/2 + .37) = -.24$$

Panel 2

$$2.52B - .93C = -1.08$$

$$-1.02B + 4.03C = -1.17$$

$$B = -.59, C = -.44, R_2 = -.77$$

$$M_{BC} = 4(-.59 - .44/2 + .77) = -.16$$

$$M_{CB} = 4(-.44 - .59/2 + .77) = .16$$

Panel 3

$$3.81C - .65D = .76$$

$$-.77C + 5.26D = +1.60$$

$$C = .18, D = -.09, R_3 = .08$$

$$M_{CD} = 3(.18 - .09/2 - .08) = .18$$

$$M_{DC} = 3(-.09 + .18/2 - .08) = -.24$$

Panel 4

$$5.0D - .5E = 1.26$$

$$-.5D + 6.5E = -.54$$

$$D = .25, E = .01, R_4 = .20$$

$$M_{DE} = 2(.25 + .01/2 - .20) = .10$$

$$M_{ED} = 2(.01 + .25/2 - .20) = -.14$$

Panel 5

$$-.5F + 6.5E = .60$$

$$5.0F - .5E = -.21$$

$$E = .09, F = -.03, R_5 = .04$$

$$M_{EF} = 2(.09 - .03/2 - .04) = .08$$

$$M_{FE} = 2(-.03 + .09/2 - .04) = -.06$$

Panel 6

$$-.77G + 5.26F = .02$$

$$3.81G - .65F = -.44$$

$$F = -.01, G = -.12, R_6 = -.10$$

$$M_{FG} = 3(-.01 - .12/2 + .10) = .09$$

$$M_{GF} = 3(-.12 - .01/2 + .10) = -.09$$

Panel 7

$$-1.02H + 4.03G = .18$$

$$2.52H - .93G = .72$$

$$G = .13, H = .33, R_7 = .35$$

$$M_{GH} = 4(.13 + .33/2 - .35) = -.24$$

$$M_{HG} = 4(.33 + .13/2 - .35) = .20$$

Panel 8

$$-1.04I + 2.54H = .48$$

$$2.52I - .90H = 0$$

$$H = .22, I = .08, R_8 = .22$$

$$M_{HI} = 4(.22 + .08/2 - .22) = .16$$

$$M_{IH} = 4(.08 + .22/2 - .22) = -.12$$

THE HISTORY OF THE
CITY OF BOSTON

FROM THE FIRST SETTLEMENT TO THE PRESENT TIME

BY NATHANIEL PHILLIPS, ESQ. OF BOSTON.

IN TWO VOLUMES.

VOLUME THE FIRST.

LONDON: PRINTED BY J. JOHNSON, ST. PAULS CHURCH-YARD, 1773.

THE SECOND VOLUME, IN TWO VOLUMES, WILL BE READY IN TWO MONTHS.

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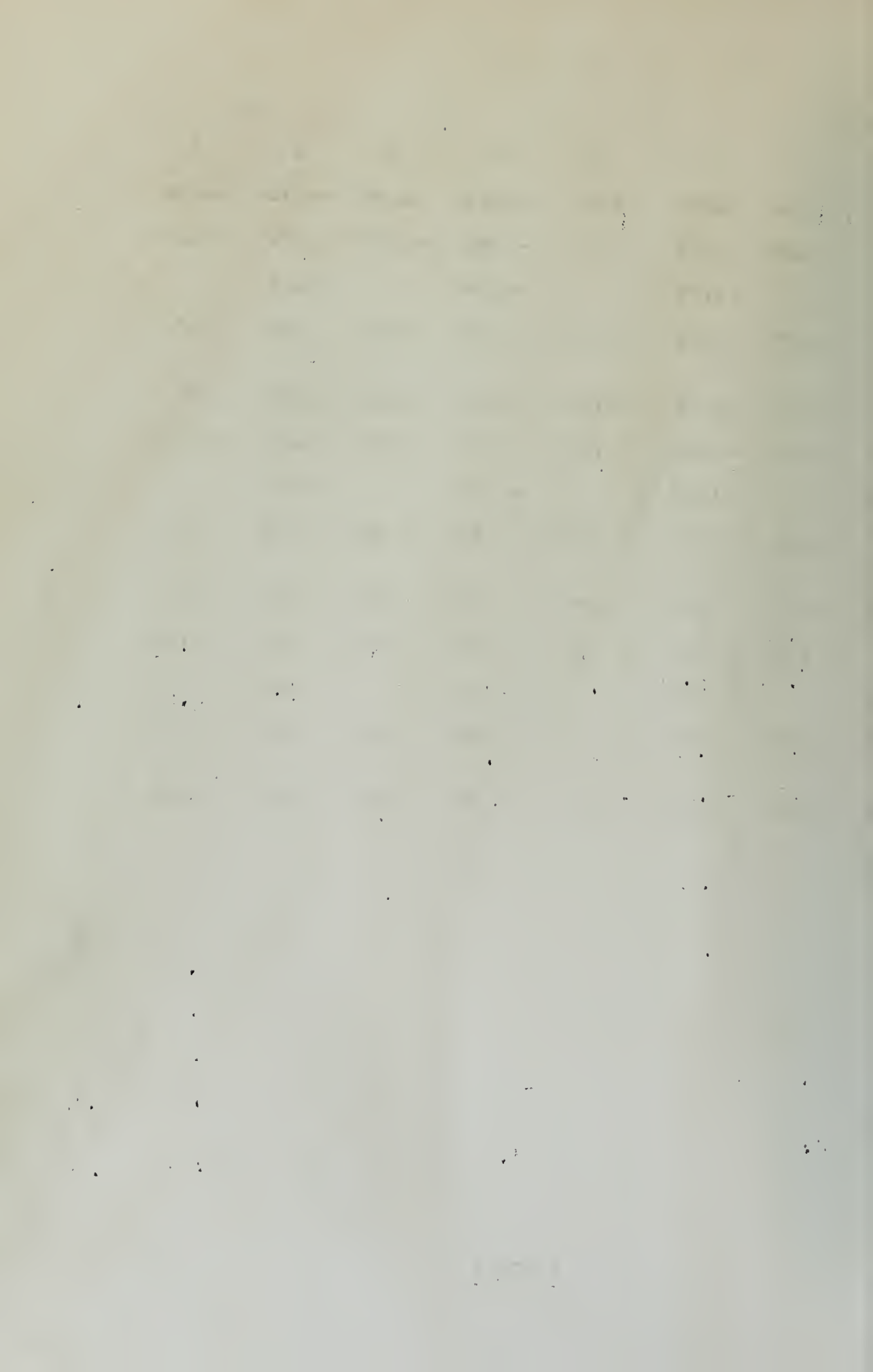
Load at D

| anel | 1 | | 2 | | 3 | | 4 | |
|------|-------|-------|-------|-------|-------|-------|-------|-------|
| oint | A | B | B | C | C | D | D | E |
| Q | 4.38 | 4.49 | 4.31 | 4.36 | 3.98 | 4.12 | -2.82 | -2.82 |
| α | 2.79 | 2.91 | 2.33 | 1.66 | 1.21 | .96 | - .61 | - .48 |
| R | 5.40 | | 4.09 | | 2.99 | | -2.23 | |
| W | -4.64 | -4.40 | -3.72 | -5.08 | -3.90 | -4.29 | 2.76 | 2.90 |
| Q | 0 | 3.72 | 4.40 | 3.90 | 5.08 | -2.76 | 4.29 | -2.88 |
| | .61 | 1.72 | 2.32 | 1.55 | 1.28 | - .34 | .82 | - .38 |
| R | 1.74 | | 2.90 | | .72 | | .33 | |
| W | -1.08 | 1.08 | .80 | - .76 | 1.17 | -1.26 | .60 | - .60 |
| Q | 0 | - .80 | -1.08 | -1.17 | .76 | - .60 | 1.26 | - .04 |
| | - .13 | - .37 | - .59 | - .44 | .18 | - .09 | .25 | .01 |
| R | - .37 | | - .77 | | .08 | | .20 | |
| W | .24 | - .24 | - .16 | .16 | .18 | - .24 | .10 | - .14 |
| M | -5.48 | -3.56 | -3.08 | -5.68 | -2.53 | -5.79 | 3.46 | 2.16 |

Load at D

| nel | 1 | | 2 | | 3 | 4 | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| int | A | B | B | C | C | D | D | E |
| Q | 4.38 | 4.49 | 4.31 | 4.36 | 3.98 | 4.12 | -2.82 | -2.82 |
| X | 2.79 | 2.91 | 2.33 | 1.66 | 1.21 | .96 | - .61 | - .48 |
| R | 5.40 | | 4.09 | | 2.99 | | -2.23 | |
| M | -4.64 | -4.40 | -3.72 | -5.08 | -3.90 | -4.29 | 2.76 | 2.90 |
| Q | 0 | 3.72 | 4.40 | 3.90 | 5.08 | -2.76 | 4.29 | -2.88 |
| | .61 | 1.72 | 2.32 | 1.55 | 1.28 | - .34 | .82 | - .38 |
| R | 1.74 | | 2.90 | | .72 | | .33 | |
| M | -1.08 | 1.08 | .80 | - .76 | 1.17 | -1.26 | .60 | - .60 |
| Q | 0 | - .80 | -1.08 | -1.17 | .76 | - .60 | 1.26 | - .04 |
| | - .13 | - .37 | - .59 | - .44 | .18 | - .09 | .25 | .01 |
| R | - .37 | | - .77 | | .08 | | .20 | |
| M | .24 | - .24 | - .16 | .16 | .18 | - .24 | .10 | - .14 |
| M | -5.48 | -3.56 | -3.08 | -5.68 | -2.53 | -5.79 | 3.46 | 2.16 |

| | 5 | | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|-------|--|
| E | F | F | G | G | H | H | I | |
| 2.82 | -2.82 | -2.46 | -2.37 | -2.61 | -2.58 | -2.70 | -2.64 | |
| .48 | - .60 | - .57 | - .72 | - .99 | -1.39 | -1.74 | -1.68 | |
| 2.22 | | -1.77 | | -2.46 | | -3.24 | | |
| 2.88 | 2.76 | 2.52 | 2.25 | 3.12 | 2.40 | 2.64 | 2.76 | |
| 2.90 | -2.52 | -2.76 | -3.12 | -2.25 | -2.64 | -2.40 | 0 | |
| .49 | - .55 | - .66 | - .93 | - .91 | -1.38 | -1.11 | - .39 | |
| .78 | | -1.20 | | -1.71 | | -1.12 | | |
| .04 | - .02 | .21 | - .18 | .44 | - .48 | - .72 | .72 | |
| .60 | - .21 | .02 | - .44 | .18 | .72 | .48 | 0 | |
| .09 | - .03 | - .01 | - .12 | .13 | .33 | .22 | .08 | |
| .04 | | - .10 | | .35 | | .22 | | |
| .08 | - .06 | .09 | - .09 | - .24 | .20 | .16 | - .12 | |
| 3.00 | 2.68 | 2.82 | 1.98 | 3.32 | 2.12 | 2.08 | 3.36 | |



Influence Line Corrections - First Set - Load at E

anel 1,8

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = 2.96$$

$$A = .49, B = 1.37, R_1 = 1.39$$

$$M_{AB} = 4(.49 + 1.37/2 - 1.39) = -.88$$

$$M_{BA} = 4(1.37 + .49/2 - 1.39) = .88$$

anel 2,7

$$2.52B - .93C = 3.52$$

$$-1.02B + 4.03C = 3.15$$

$$B = 1.86, C = 1.25, R_2 = 2.33$$

$$M_{BC} = 4(1.86 + 1.25/2 - 2.33) = .60$$

$$M_{CB} = 4(1.25 + 1.86/2 - 2.33) = -.60$$

anel 3,6

$$3.81C - .65D = 4.00$$

$$-.77C + 5.26D = 3.66$$

$$C = 1.20, D = .87, R_3 = 1.55$$

$$M_{CD} = 3(1.20 + .87/2 - 1.55) = .24$$

$$M_{DC} = 3(.87 + 1.20/2 - 1.55) = -.24$$

anel 4,5

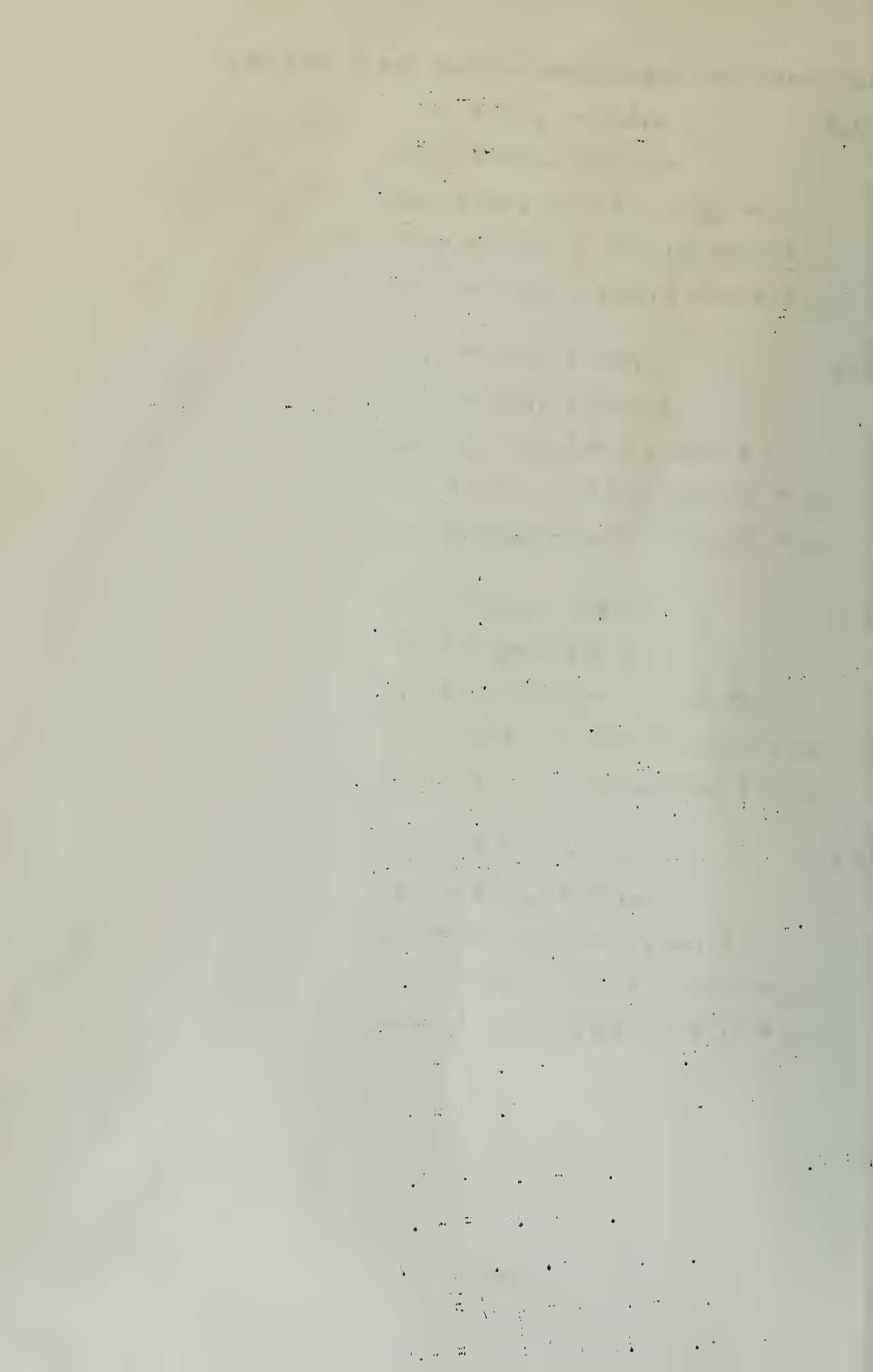
$$5.0D - .5E = 3.45$$

$$-1.5D + 6.5E = -.84$$

$$D = .64, E = -.54, R_4 = .08$$

$$M_{DE} = 2(.64 - .54/2 - .08) = .58$$

$$M_{ED} = 2(-.54 + .64/2 - .08) = -.60$$



Influence Line Corrections - Second Set - Load at E

Panel 1,8

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -.20$$

$$A = -.10, B = -.28, R_1 = -.28$$

$$M_{AB} = 4(-.10 - .28/2 + .28) = .16$$

$$M_{BA} = 4(-.28 - .10/2 + .28) = -.20$$

Panel 2,7

$$2.52B - .93C = -.88$$

$$-1.02B + 4.3C = -.24$$

$$B = -.41, C = -.16, R_2 = -.43$$

$$M_{BC} = 4(-.41 - .16/2 + .43) = -.24$$

$$M_{CB} = 4(-.16 - .41/2 + .43) = .24$$

Panel 3,6

$$3.81C - .65D = .60$$

$$-.77C + 5.26D = -.58$$

$$C = .14, D = -.09, R_3 = .04$$

$$M_{CD} = 3(.14 - .09/2 - .04) = .18$$

$$M_{DC} = 3(-.09 + .14/2 - .04) = -.18$$

Panel 4,5

$$5.1D - .51E = .24$$

$$-.5D + 6.5E = -.60$$

$$D = .04, E = -.09, R_4 = -.04$$

$$M_{DE} = 2(.04 - .09/2 + .04) = .06$$

$$M_{ED} = 2(-.09 + .04/2 + .04) = -.06$$

3

1

4

[illegible]

100

1990

100

100

1. *Phragmites australis* (Cav.) Trin. ex Steud.

1. The first group of people who are interested in the results of the study are the researchers themselves. They want to know if the study was successful in achieving its goals and if the results are consistent with their expectations. They also want to know if the study was conducted in a rigorous and unbiased manner.

1900-1901 - 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004

1. *Chlorophyll a* (Chl *a*)

Journal of Management Studies, 19(1), 67-80.

100

1. *Phragmites australis* (Cav.) Trin. ex Steud.

1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.

10

Load at E

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point | A | B | B | C | C | D | D | E |
| Q | 3.51 | 3.59 | 3.44 | 3.49 | 3.18 | 3.30 | 3.25 | 3.75 |
| X | 2.22 | 2.33 | 1.86 | 1.33 | .97 | .77 | .82 | .64 |
| R | 4.32 | | 3.26 | | 2.40 | | 2.97 | |
| L | -3.76 | -3.52 | -2.96 | -4.00 | -3.15 | -3.45 | -3.66 | -3.84 |
| Q | 0 | 2.96 | 3.52 | 3.15 | 4.00 | 3.66 | 3.45 | -3.84 |
| X | .49 | 1.37 | 1.86 | 1.25 | 1.20 | .87 | .64 | -.54 |
| R | 1.39 | | 2.33 | | 1.55 | | .08 | |
| L | .88 | .88 | .60 | -.60 | .24 | -.24 | .58 | -.60 |
| Q | 0 | -.60 | -.88 | -.24 | .60 | -.58 | .24 | -.60 |
| X | .10 | -.28 | -.41 | -.16 | .14 | -.09 | .04 | -.09 |
| R | -.28 | | -.3 | | .04 | | .04 | |
| L | .16 | -.20 | -.24 | .24 | .18 | -.18 | .06 | -.06 |
| L | -4.48 | -2.84 | -2.60 | -4.36 | -2.73 | -3.87 | -3.02 | -4.50 |

| | 5 | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|--------|
| E | F | F | G | G | H | H | I |
| 3.75 | -3.75 | -3.30 | -3.18 | -3.49 | -3.44 | -3.59 | -3.51 |
| .64 | - .82 | - .77 | - .97 | -1.33 | -1.86 | -2.73 | -2.22 |
| 2.97 | | -2.40 | | -3.26 | | -4.32 | |
| 3.84 | 3.66 | 3.45 | 3.15 | 4.00 | 2.96 | 3.52 | 3.76 |
| 3.84 | -3.45 | -3.66 | -4.00 | -3.15 | -3.52 | -2.96 | 0 |
| .54 | - .64 | - .87 | -1.20 | -1.25 | -1.86 | -1.37 | - .149 |
| .08 | | -1.55 | | -2.33 | | -1.39 | |
| .60 | - .58 | .24 | - .24 | .60 | - .60 | - .88 | .88 |
| .60 | - .24 | .58 | - .60 | .24 | .88 | .60 | 0 |
| .09 | - .04 | .09 | - .14 | .16 | .41 | .28 | .10 |
| .04 | | - .04 | | .43 | | .28 | |
| .06 | - .06 | .18 | - .18 | .24 | .24 | .20 | - .16 |
| 4.50 | 3.02 | 3.87 | 2.73 | 4.36 | 2.60 | 2.84 | 4.48 |

Moment Computations - Web Members

Member AA' DL = 3510 fk
 LL-E60 = 3008
 Impact = 644
 Total = 7162

LL H15-S12-44 = 412
 Conc. = 97
 Impact = 70
 Total = 579

Sidewalk = 246

Design Moment = 7,937 fk

Member BB' DL = 3980 fk
 LL-E60 = 3395
 Impact = 725
 Total = 8100

LL H15-S12-44 = 465
 Conc. = 109
 Impact = 78
 Total = 652

Sidewalk = 278

Design Moment = 9,030 fk

Member CC' DL = 3690 fk
 LL-E60 = 3200
 Impact = 736
 Total = 7626

LL H15-S12-44 = 432
 Conc. = 101
 Impact = 80
 Total = 613

Sidewalk = 258

Design Moment = 8,497 fk

ber DD'

DL = 2422 f.k.

LL-E60 = 2193

Impact = 590

Total = 5205

LL H15-S12 - 44 = 284

Conc. = 97

Impact = 66

Total = 447

Sidewalk = 192

Design Moment = 5,844 f.k.

ber EE'

DL = 1323 f.k.

LL-E60 = 1272

Impact = 445

Total = 3040

LL H15-S12-44 = 155

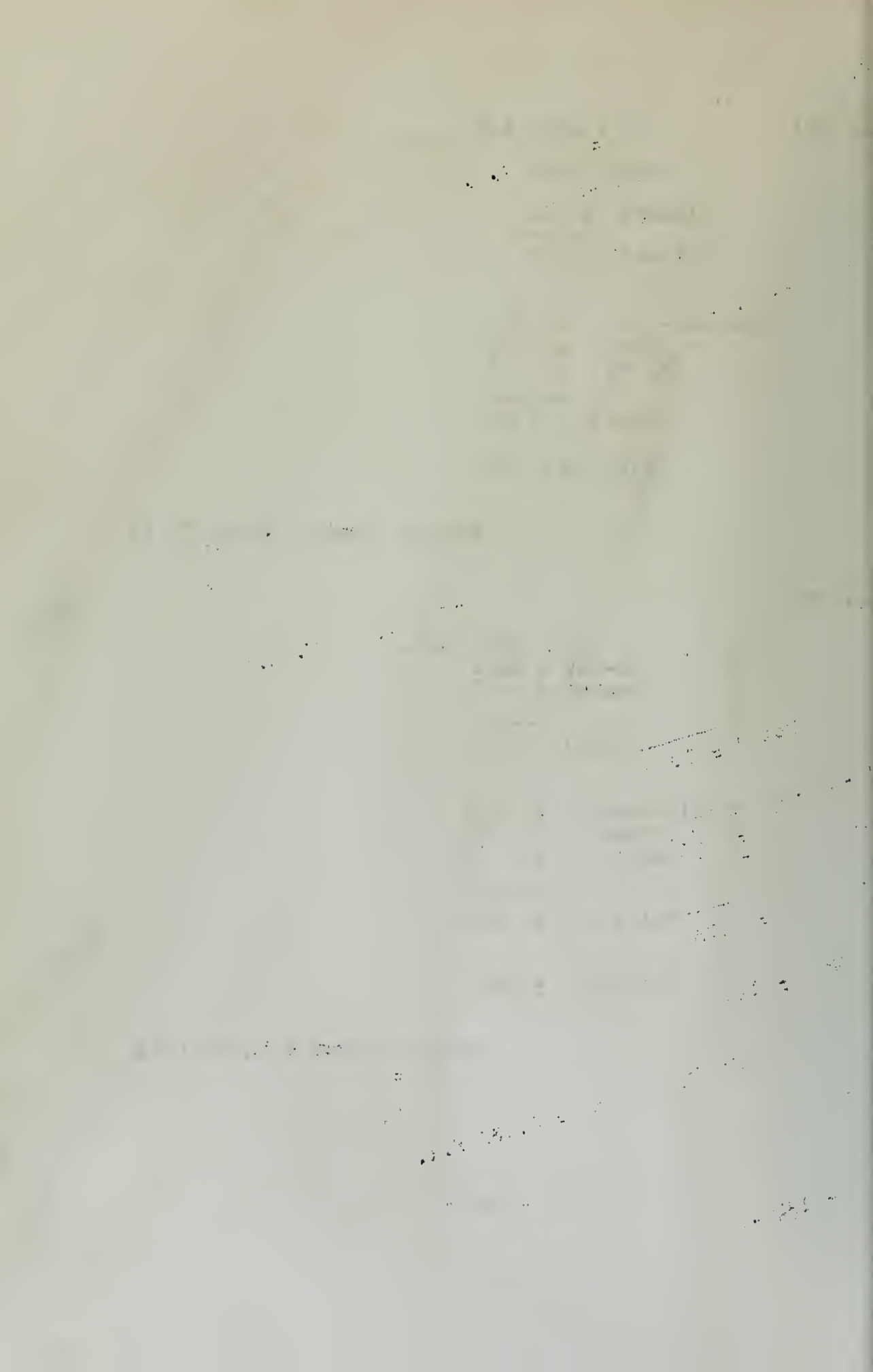
Conc. = 73

Impact = 47

Total = 275

Sidewalk = 120

Design Moment = 3,435 f.k.



Moment Computations - Chord Members

Member AB

| | | |
|--------|---|-----------|
| DL | = | 3510 f.k. |
| LL-E60 | = | 3008 |
| Impact | = | 644 |
| <hr/> | | |
| Total | = | 7162 |

| | | |
|---------------|---|-----|
| LL H15-S12-44 | = | 412 |
| Conc. | = | 97 |
| Impact | = | 70 |
| <hr/> | | |
| Total | = | 579 |
| Sidewalk | = | 246 |

Design Moment = 7,987 f.k.

Member BC

| | | |
|--------|---|-----------|
| DL | = | 3120 f.k. |
| LL-E60 | = | 2800 |
| Impact | = | 642 |
| <hr/> | | |
| Total | = | 6562 |

| | | |
|---------------|---|-----|
| LL H15-S12-44 | = | 365 |
| Conc. | = | 105 |
| Impact | = | 71 |
| <hr/> | | |
| Total | = | 541 |
| Sidewalk | = | 226 |

Design Moment = 7,329 f.k.

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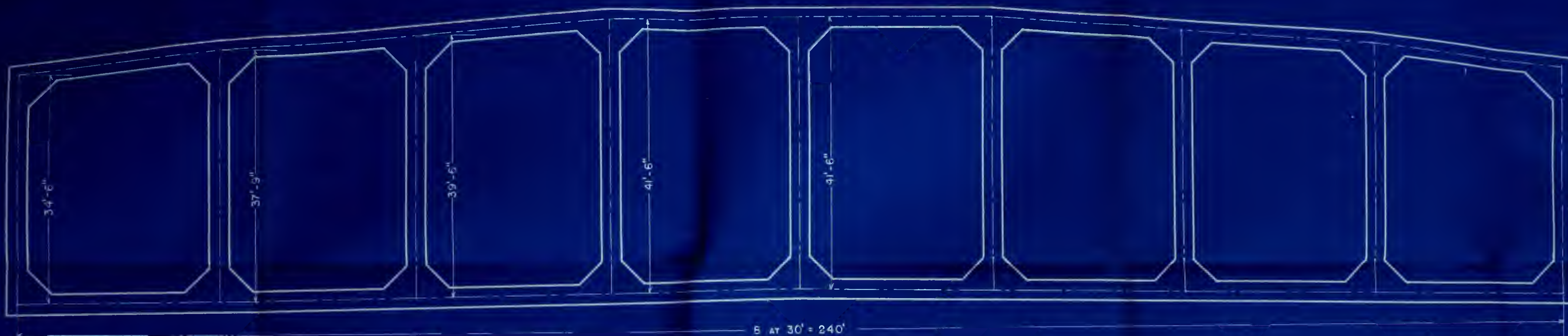
| | | |
|---------------|---|------|
| DL | = | 1828 |
| W-E60 | = | 1692 |
| Impact | = | 434 |
| <hr/> | | |
| Total | = | 3954 |
|
 | | |
| LL H15-S12-44 | = | 214 |
| Conc. | = | 78 |
| Impact | = | 49 |
| <hr/> | | |
| Total | = | 341 |
|
 | | |
| Sidewalk | = | 141 |

Design Moment = 4,436 f.k.

er DE

| | | |
|---------------|---|------|
| DL | = | 1172 |
| W-E60 | = | 1138 |
| Impact | = | 342 |
| <hr/> | | |
| Total | = | 2652 |
|
 | | |
| LL H15-S12-44 | = | 137 |
| Conc. | = | 61 |
| Impact | = | 37 |
| <hr/> | | |
| Total | = | 235 |
|
 | | |
| Sidewalk | = | 99 |

Design Moment = 2,986 f.k.



$$m = \frac{37.75 - 34.50}{37.75} = 0.0866$$

$$m = \frac{39.50 - 37.75}{39.50} = 0.0443$$

$$m = \frac{41.50 - 39.50}{41.50} = 0.0482$$

$$m = \frac{41.50 - 41.50}{41.50} = 0$$

$$m = \frac{41.50 - 41.50}{41.50} = 0$$

$$m = \frac{41.50 - 39.50}{41.50} = 0.0482$$

$$m = \frac{39.50 - 37.75}{39.50} = 0.0443$$

$$m = \frac{37.75 - 34.50}{37.75} = 0.0866$$

$$n = \frac{37.75 - 34.50}{34.50} = 0.0942$$

$$n = \frac{39.50 - 37.75}{37.75} = 0.0463$$

$$n = \frac{41.50 - 39.50}{39.50} = 0.0507$$

$$n = \frac{41.50 - 41.50}{41.50} = 0$$

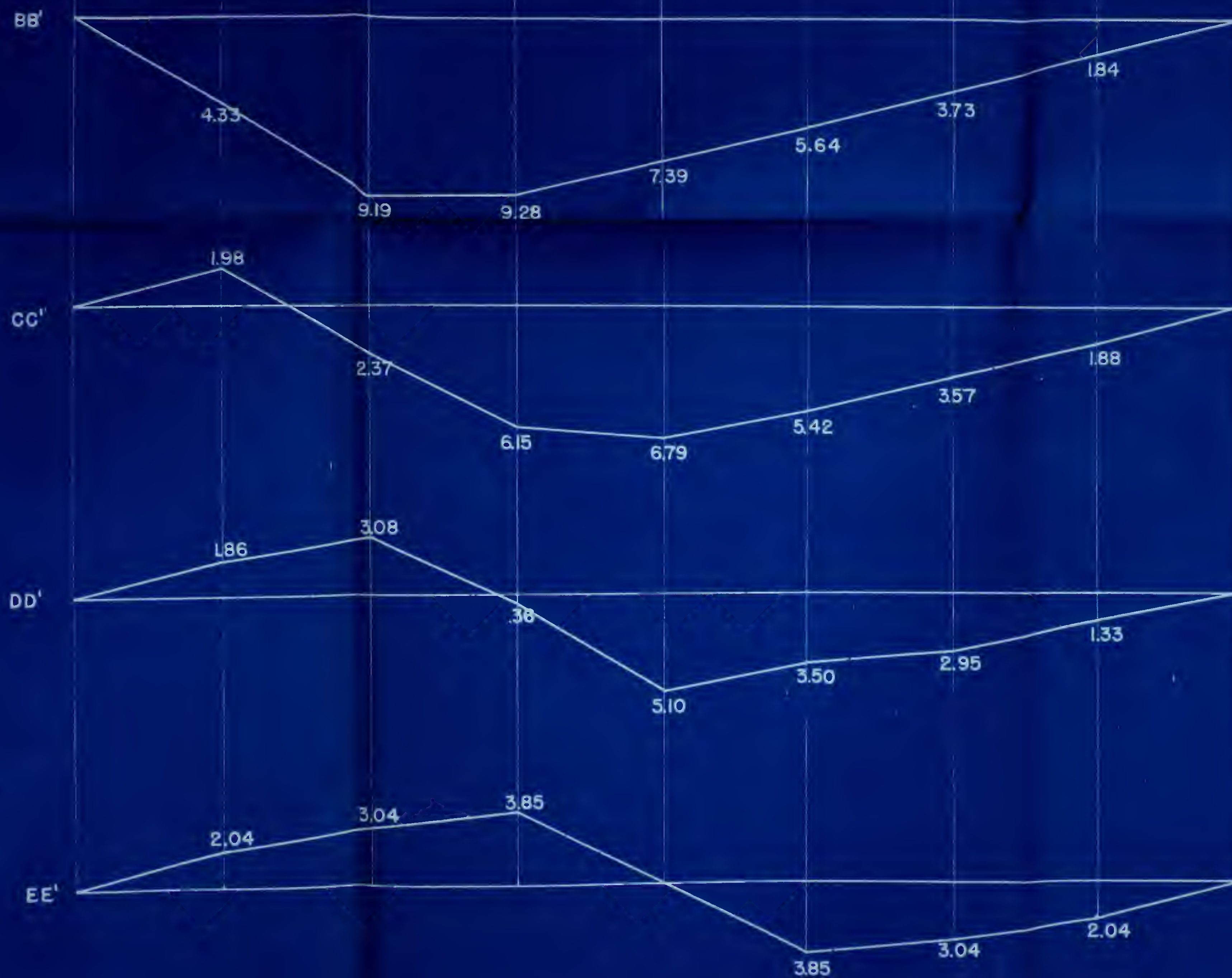
$$n = \frac{41.50 - 41.50}{41.50} = 0$$

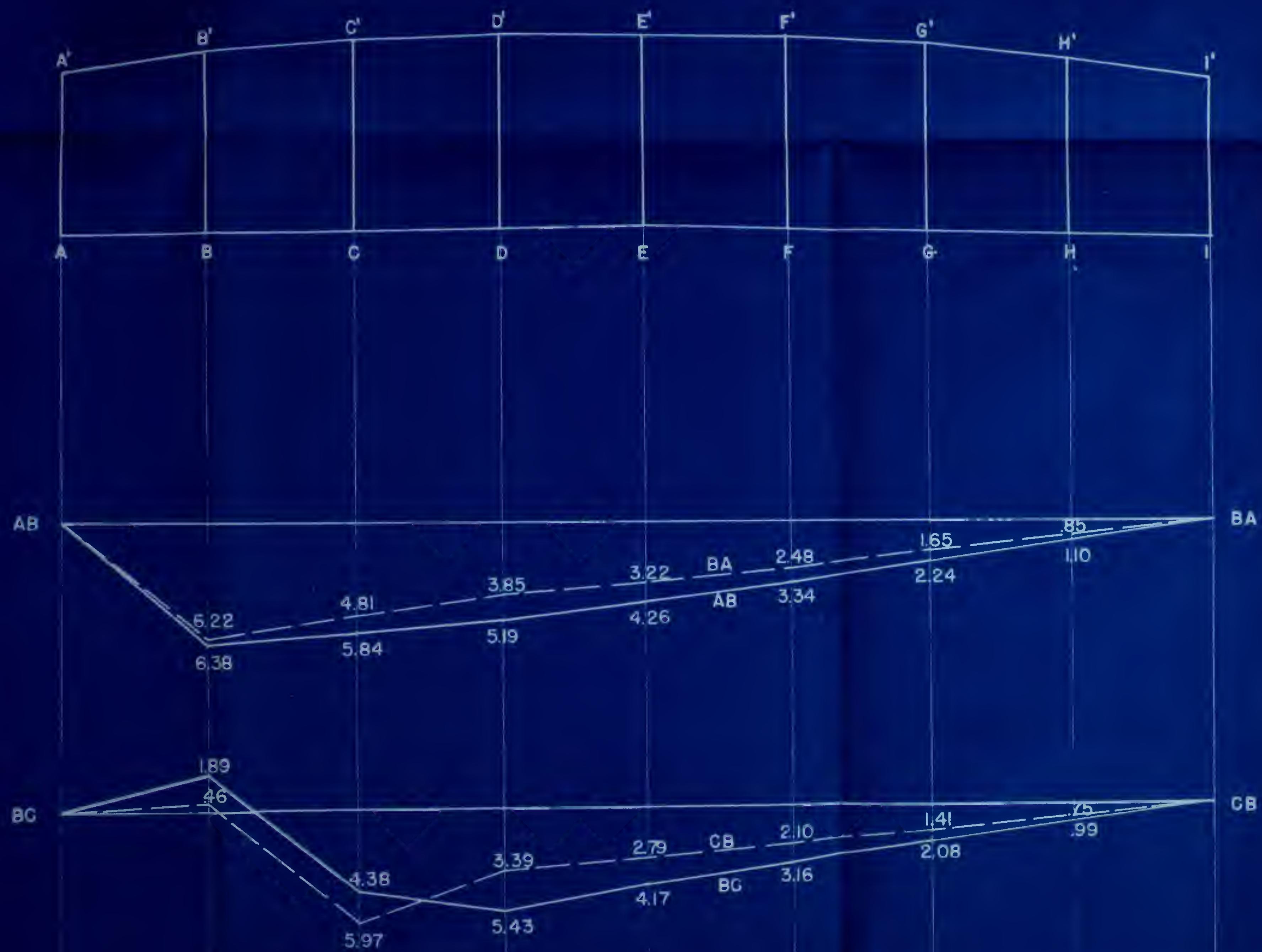
$$n = \frac{41.50 - 39.50}{39.50} = 0.0507$$

$$n = \frac{39.50 - 37.75}{37.75} = 0.0463$$

$$n = \frac{37.75 - 34.50}{34.50} = 0.0942$$

ELEVATION
VIERENDEEL TRUSS
RENSSELAER POLYTECHNIC INSTITUTE
JUNE 1948
J. J. MANNING JR.
SCALE 1" = 10'
L. H. EDING







INFLUENCE LINES

FIRST SET

VIERENDEEL TRUSS

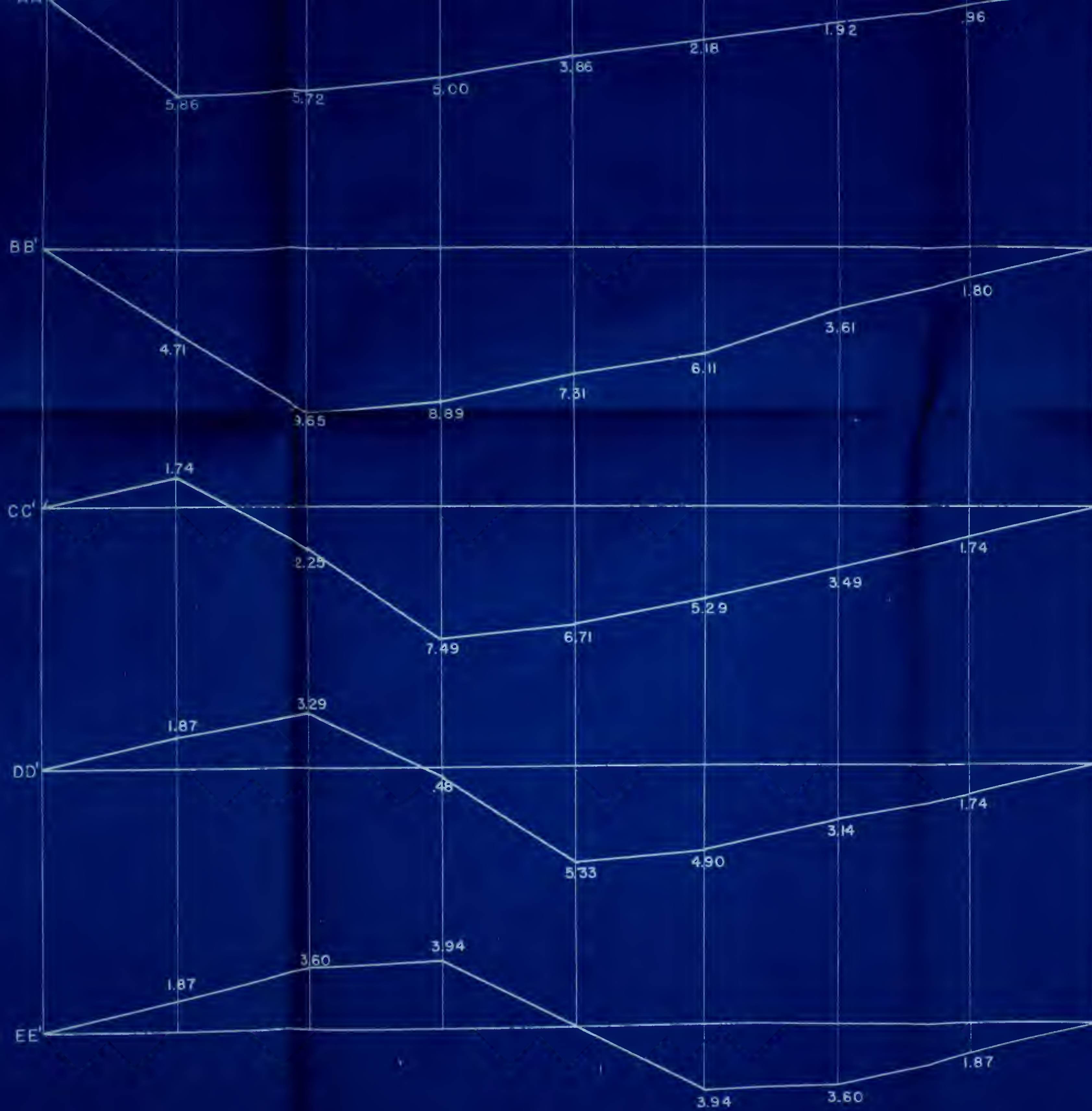
RENSSELAER POLYTECHNIC INSTITUTE

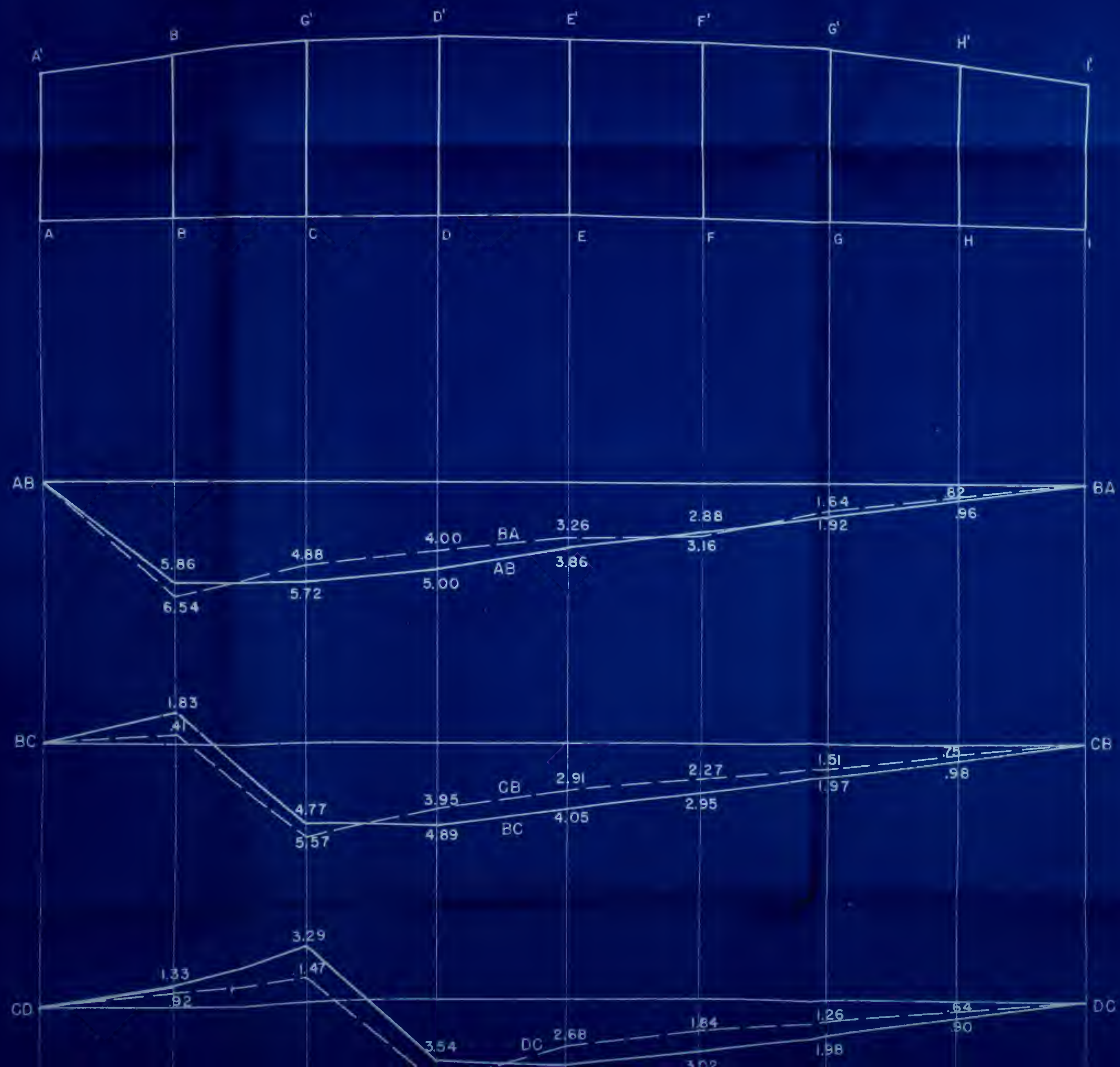
JUNE 1948

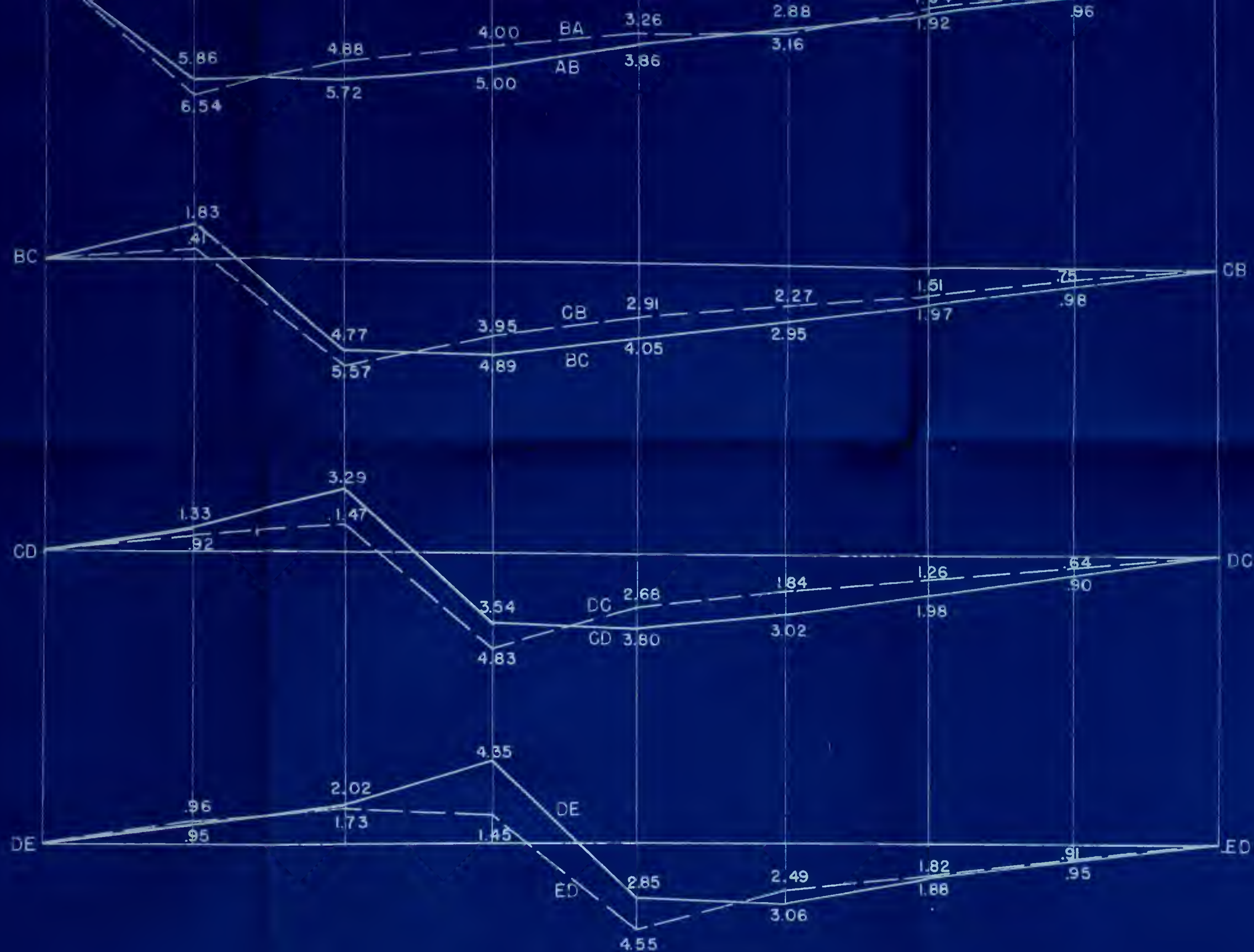
J. J. MANNING JR.

1" = 5 F.K.

L. H. EDING







INFLUENCE LINES FIRST SET VIERENDEEL TRUSS

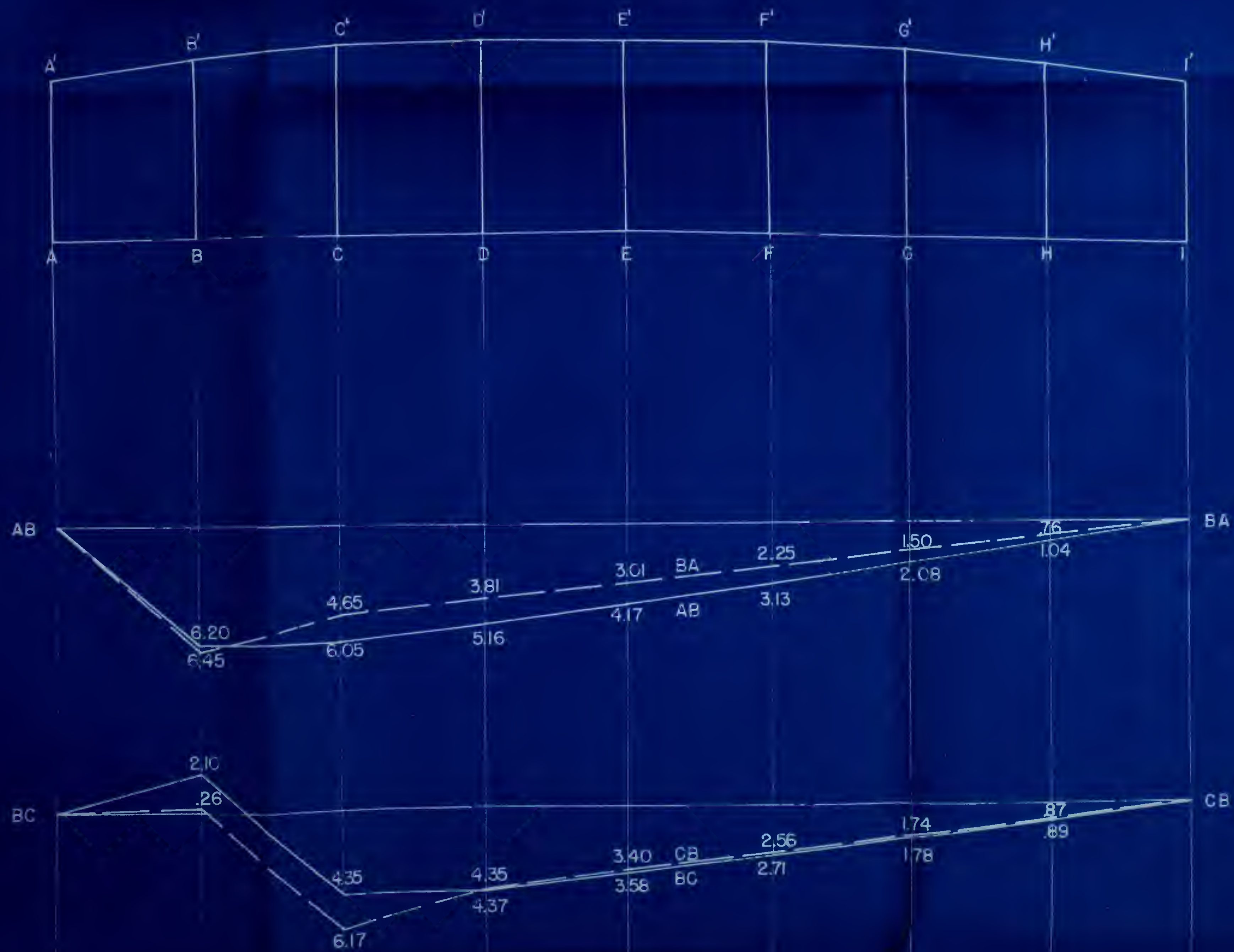
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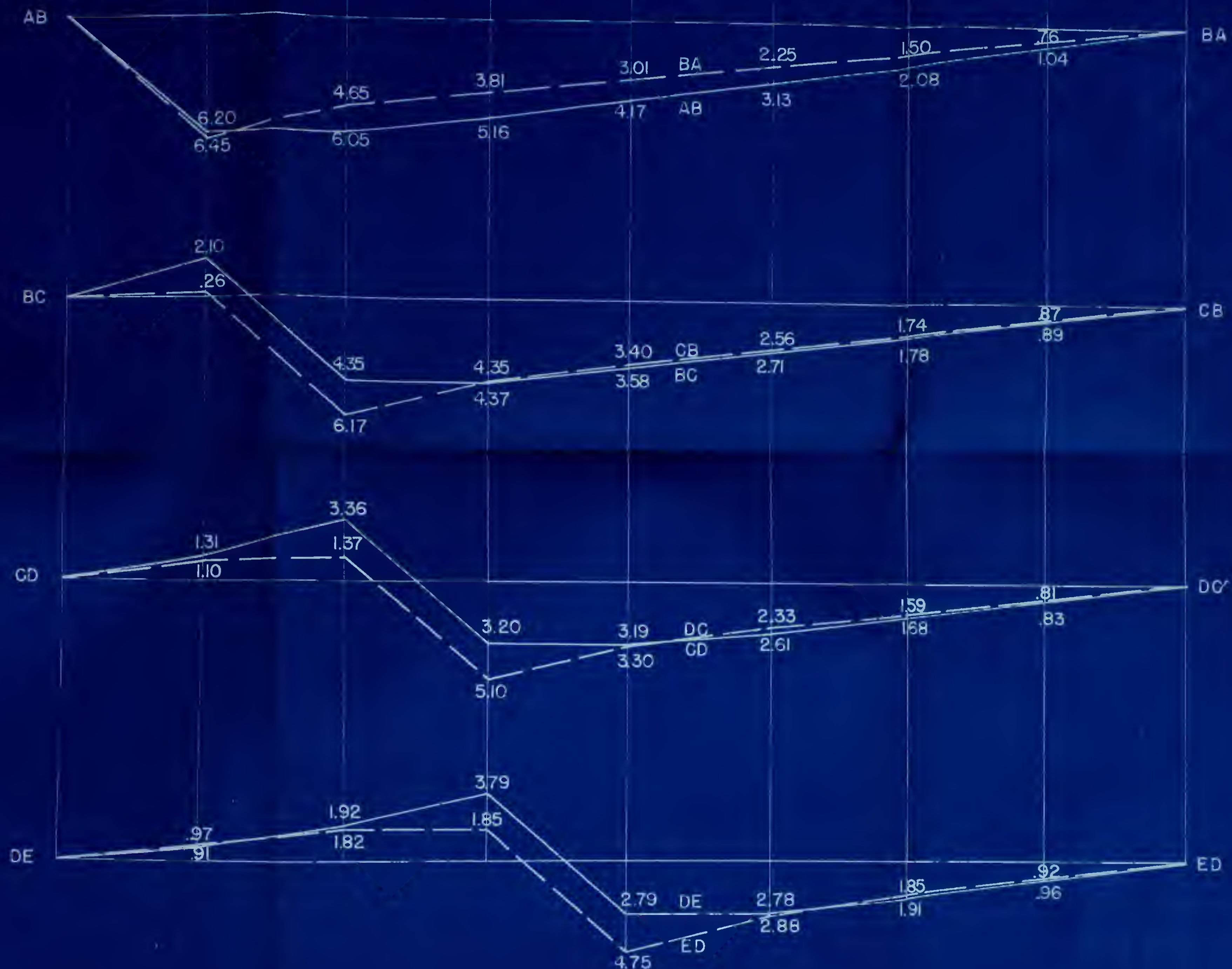
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1" = 5 F. K.

L. H. EDING





INFLUENCE LINES

THIRD SET

VIERENDEEL TRUSS

RENSSELAER POLYTECHNIC INSTITUTE

JUNE 1948

J. J. MANNING JR.

1"=5 F.K.

L. H. EDING



INFLUENCE LINES FOURTH SET VIERENDEEL TRUSS

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Thesis

6889

M3 Manning

Investigation of the
effect of stiffness of
members upon the solution
of Vierendeel trusses.

Thesis

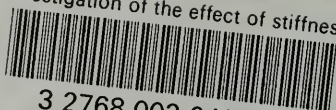
6889

M3 Manning

Investigation of the
effect of stiffness of
members upon the solution
of Vierendeel trusses.

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Investigation of the effect of stiffness



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